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CONSTRUCTIVE NATURAL THEOLOGY

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BY

NEWMAN SMYTH

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PREFACE

THE number of thoughtful persons is increasing who desire to know in what state a full acceptance of the results of scientific research shall leave our cherished human faiths and hopes. They sometimes ask, Are we indeed to lose our life and the ideals that make it most worth living for the sake of gaining a whole world of material knowledge? Shall nature be divested of its spiritual beauty and meaning as science takes reason behind the scenes and discloses the machinery of the stage on which the passing generations play their transient part?

The writer of these pages has long been convinced that the scientific revelations of the processes of nature, and of our own lives as facts of nature, should all be religiously accepted; and that the working theories also which are generally received in the scientific world, should provisionally, at least, be recog-

nized in theological thinking. With this conviction the assurance has grown that the modern sciences not only reopen old problems of philosophy, but also afford fresh and rich material for religious thought to gather and to use as vitalizing means of its own spirit. The sciences have gained full enough new knowledge to prepare the way for a new spiritual interpretation of nature. Yet in these fields, already white for the harvest, the theological laborers are few.

The ultimate problem toward which alike the natural sciences and our spiritual faiths lead up, is the meaning of personality as a fact in nature. While engaged in preparing for future publication a volume relating to this central problem, of final significance, upon which many lines of inquiry converge, the opportunity came to me to deliver a brief course of lectures upon the Taylor Foundation of the Yale School of Religion. Doctor Nathaniel W. Taylor was one of a succession of theologians in New England who accepted and used the science of their times in their reasoning from the works of God. But to follow in this respect their

example would require of us in our day an abandonment of a merely neutral position and suspicious attitude toward science, and a positive reconstruction of philosophical and religious views of nature and ourselves. Religious education from the Sunday-school to the university, and in the trained and reverent freedom of the pulpit, should follow a constructive scientific principle, and keep close to the facts of nature and life, if spiritual faith is to live anew; Lowell's lines, in the "Cathedral," afford an excellent motto for religious education:

> "Science was Faith once; Faith were Science now,
> Would she but lay her bow and arrows by
> And arm her with the weapons of the time.
> Nothing that keeps thought out is safe from thought.
> For there's no virgin-fort but self-respect,
> And Truth defensive hath lost hold on God."

It was obviously impossible to condense within these lectures the contemplated systematic presentation of the subjects considered in the following pages, and an adequate review of the extensive literature which their discus-

sion requires; I have sought, therefore, in an introductory way, to offer a rapid survey of the abundant scientific materials waiting to be utilized in religious thought, and to outline simply the method which, in a subsequent volume, I hope to follow in detail more thoroughly. For this purpose it has seemed best to leave the form of spoken address, with some minor exceptions, unaltered. While occasional paragraphs indicate views to which I have been led, and some foot-notes refer to authorities for students to consult, a chief object of these lectures is to show what a rich scientific field is ripe for spiritual reaping, and especially to stimulate thoughtful believers, as well as professional teachers of religion, to go to school to nature for fresh inspiration and larger, serener faith.

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CONSTRUCTIVE NATURAL THEOLOGY

I

SCIENTIFIC MATERIALS FOR THEOLOGY

NATURAL theology, or the knowledge of God to be derived from the works of nature, has commonly been distinguished from revealed theology, or the knowledge of God to be learned from the Bible. But the natural theology which some fifty years ago was taught in many of our colleges as a necessary part of a liberal education, has not only disappeared from the prescribed courses of study in the universities, but it has ceased generally to be recognized as such in the schools of divinity. The once highly esteemed and much read "Bridgewater Treatises," with their reasonings from nature to God, now occupy places of honorable retirement on the shelves of the libraries; Pa-

ley's "Evidences" have been ruled out of court by Darwinian science; and even Butler's great "Analogy of Religion to the Constitution and Course of Nature" no longer is served at training-tables for theological athletes; though an abundance of fresh sociological milk can hardly take the place of strong meat for those who in understanding would be men.

The older natural theology, strongly built as it was from the scientific materials of its times, has been abandoned as an antiquated and no longer tenable fortification. But some theology of nature, constructed in accordance with the known mechanical principles of evolution, is indispensable to a reasonably secure religious faith. To fail to follow the progressive self-revelation of nature would be for us less manly in our thinking, less reasonable in our believing, and less free and brave in the mastery of the science of our day, than were our fathers before us as they stoutly maintained their well-fortified dogmas and held up their theological banners to be displayed because of truth. Natural theology may not now go forth with Paley to find that remarkable watch in crossing a heath;

but it may inquire what the least particle of earth has to tell of its atoms or the energies of electrons, while the flowers in full bloom on the heath may ask us to behold some diviner secret in their flourishing; and from afar and above we may take heed of suggestions of ethereal influences amid which the worlds that do appear were fashioned of the things that are not seen.

It may well be true that if intellectual power were given us to search through the infinitude of outlying space, we might never meet face to face a Divine Artificer, or discover the universe to be a vast assembling-room of mechanically designed elements and worlds; but possibly in our time, if we have eyes to see, we may behold a Sower going forth to sow in the fields of infinite space, and with new wonder consider the clusters of the stars how they grew. Yet not with naïve childlikeness merely may we transfer the parable of the lilies of the field to the constellations of the heavens. If our spiritual imagination is to be scientific; if religious faith is not to be a child's fancy thrown lightly out upon the mystery of the world; then a new natural theology must be formed from the ascer-

tained data of natural science. Faith is to be once more a man's achievement; belief a reasonable generalization after laborious research into the elements and processes given in human experience. Such a natural theology is to be based on foundations of known facts of nature; it is to be built with as little hypothetical theory as possible; its soundness is to be examined after every new advance of science; its inner truth verified in any profounder insight into life.

This is indeed a hard saying; and we may well ask, Who of us is equal to it? No one intellect is; no single science is; nor is any school of philosophy, not even the most confident pragmatism, equal to this task. Nevertheless, many minds and countless investigators—they who have eyes to see the least things in nature that they may understand the great, or ears to hear the whispers of the Spirit in human experience that they may catch the full meaning of life,—these all are coworkers in discovering the significance of the creation; these shall be interpreters of man's spiritual vision of the heavens, and his dream of ideal ends of being. But

whoever fears with clear-eyed reason, though often with hushed heart, to set forth on this great adventure of science and faith; whoever dares not face reality in the spirit of a man; he may become a scientific automaton or a theological talking-box, but never a true thinker or a great believer. Only a theology fairly won from nature and experience can command the modern mind. What are we doing to meet this demand?

I would raise this preliminary inquiry—one might almost say this challenge—to the ministerial education and theology of our day: How are we facing this demand? What are we doing in the education of the teachers of religion to provide a natural theology adapted to the modern mind?

It may readily be answered, the philosophy of religion has now a large place in collegiate courses, and some recognition in most divinity schools. But that title betrays unfitness for the specific course now required. It is not first a philosophy but a natural history of the religious consciousness that we must seek in order to understand what personal life really means.

If we go first to nature with ready-made philosophies to be proved, we shall return no wiser than we went.[1]

My question now is: To what extent is it required in the education of students for the ministry that (either in their college studies or in some seminary courses) they shall be well-grounded in the sciences—such as physics, general biology, or experimental and genetic psychology? Is instruction in natural theology in schools of divinity keeping pace with advances in natural science? The sciences are so progressive in their experimental methods that their laboratories have to be constantly renewed. But when one observes how meagre provision is generally made for the education of theological students in scientific methods and results of research, he may wonder whether it is due to poverty of endowments that a better equipment is not provided to fit clergymen

[1] I would not be understood as depreciating much work that is done in courses of divinity commonly designated as Apologetics, Theism, and Philosophy of Religion; and I would acknowledge especially the thorough work which the late Professor Samuel Harris, of the Yale Divinity School, completed in his published lectures on "The Philosophical Basis of Theism" and "The Self-Revelation of God."

to understand the modern mind in its scientific passion to find out what can be known, or whether it is due to the same reason that Samuel Johnson once gave to a woman who asked him why he had defined in his dictionary the word "pastern" as the knee of a horse: "Ignorance, Madam," he replied; "pure ignorance." [1]

To young men who are thinking of entering the ministry are we ready to give such advice as this, which, from "The Corner of Harley Street," Peter Harding, M.D., wrote to his son, who was considering entering the medical profession: "You must ask yourself, with all the earnestness of a novice at his altar-vigil,

[1] In New College, Edinburgh, such instruction is furnished, and examination in Professor Simpson's course of general biology is required for a degree in divinity. In looking through the courses of some thirty-four Protestant theological seminaries in this country I have noticed three in which some specific scientific teaching is provided, or required of students in advanced courses. In five others natural theology is to some extent recognized under other names; there are traces of it as minor parts of instruction in other seminaries; in most of them, however, the symptoms of such teaching are not sufficiently marked to enable one to diagnose positively its character. Two features characterize generally, with some honorable exceptions, this teaching: the method is negative, it is an attempted destruction of scientific objections; and also the books referred to are not distinguished by familiarity with scientific researches up to date.

'Am I prepared to *know?*' . . . The eyes of humanity are turning slowly, but very surely, toward the man who *knows*. Are you prepared to become such a man? . . . You will probably turn upon me and say, 'But to cultivate this habit of forming proper mental pictures, I shall have to become at least a chemist, a physicist, a pathologist, a bacteriologist, to say nothing of a philosopher; and how can a single human being, however industrious, contain as many persons as these?' And of course he can not. Upon no more than one branch of the tree of healing will it be given to you to climb out a little farther than your fellows; but, at any rate, you can keep your eye upon the others. It is in this way alone that you can become a scientific physician in the best and broadest sense. And you can take my word for it that it will never be worth your while to become any other sort of a sawbones—an exacting prospect." (Pp. 24 *sq.*) Shall any less be required of a physician of souls? Shall not he keep his eye on the other branches of the tree of life? Is it worth while to become any other sort of a theological sawbones? An answer comes to

us here from an oft-repeated word of the New England theologian, in whose memory this lectureship was founded; it sounds like a bugle-call: "Follow truth though it takes you over Niagara!" With this note religion itself may make its appeal to students of divinity to be men who will *know*.

Let me emphasize at the outset the first word descriptive of the natural theology that shall be adapted to the need of the modern mind; it must be constructive. We are not here on this earth as beings "breathing thoughtful breath," to spend that breath chiefly in arguing one another down; happily the controversial divine, so fitly characterized by Doctor Thomas Fuller in the stormy period of the seventeenth century, is rarely to be met with now in good Christian society. Truth calls us to better service than to manufacture proofs against manufactured objections; it bids us seek until we find it. We are here to use our reason to the utmost, to learn what may be known of realities —of what is right and true, and well worth living for in our brief hour in the midst of this daily wonder and partial revelation and vaster

significance of the universe. The first task, therefore, of natural theology is to discern what indications, if any, are given in the natural sciences for the reasonable interpretation of the world and ourselves in it. Where, then, are we to look for the materials for such constructive thought?

The answer in general is near at hand: all ascertained facts of science are material for natural theology. From far and near, from the least to the greatest, everything that research may discover, or experience make its own, is to be welcomed as having worth and meaning for the interpretation of the world. To natural theology, with its outspread sheet, nothing can be common or unclean.

There is nothing merely so mechanical in physics that it can be understood only as a problem of strains and stresses; nothing so purely quantitative that it can be left entirely to the mathematicians; nothing so simply chemical that it can remain wholly in the retorts of the laboratories; in short, there is not a single thing in the universe that exists for itself alone; in their correlations, taken alto-

gether, existing things constitute the reality that is given us for our rational interpretation.

To say this is to assert the right of natural theology as a pupil in the laboratories of the university; at the same time it is to acknowledge its duty to enter there as a learner that it may become a master among the teachers of the meanings of life. This is by no means to confuse science by introducing metaphysics, but it is to bid the philosophy of religion first to go to school to the natural in order that it may become fit to enter into the kingdom of the spiritual. This is likewise to recognize in nature without us the same double aspect that is presented in personal consciousness—the too often overlooked truth that all material fact presents to us a transcendental problem; everything that is given in nature is given as an interrogation to the reason that is in man. Thus, to take a single example, in the Cavendish laboratory, radium rays were passed through a supersaturated tube which had been ingeniously contrived for the desired experiment (*beta* as well as *alpha* rays being used). As a ray passes, it causes the atoms through which

it goes to break into corpuscles, called ions, and on these, at a sudden expansion of the gas in the tube, minute drops of moisture are condensed, so that the radium particle leaves after it to mark its way a vaporous trail. By a simultaneous electric flash that line of vaporization was photographed, so that one may see the very path along which an infinitesimal particle of a radium ray took its flight through the tube. On these photographs a curve at the end of some of these vaporous lines shows where a corpuscle had dropped its electric charge, slowed up, and become inert.[1] Ocular demonstration has thus been given of things invisible, which theoretical views of the constitution of the atom had rendered probable; what no eye has seen or can see has been proved to be existent; these infinitesimal particles of the radium rays have become evident and measurable in their streaming through the atmosphere of that glass tube, as is the passage of a comet with its train of light across the sky. We know now that the electrons *are*—

[1] *Proceedings of the Royal Society*, A. vol. 87, 1912, p. 277, C. T. R. Wilson.

but *what* are they? What does all this, of which I am speaking, taken as a whole, mean —these dissociated atoms, these unknown yet demonstrable electrons, these motions, collisions, separations, recombinations, and those other rays still more ethereal in that same glass tube in the Cavendish laboratory; and, furthermore, the mind devising, arranging that tube with its unseen contents, and by a simultaneous electric flash causing it to reveal its secret; the trained intelligence that found there the very substance of the things which it believed must be there, or else it could not understand the things that are seen? What, as a connected whole, do all these things together signify? What does it *mean*—this verification of a reasonable expectation which nature gives to the reason watching in man? Physical science hands over to natural theology this vacuum tube with its new revelation of invisible energy, that it may be comprehended in the omnipresent mystery of divinity still to be revealed. But if our theology is not faithful in this molecule of radium, which is very little, how shall it be faithful also in that which

is much? If in our schools of divinity we are not faithful in this material knowledge, who shall commit to our trust the true riches?

Let me mention another illustrative instance. I look through a microscope at a section of the egg of a humble worm, *Ascaris*. I have the wonder of the world of life there beneath my eye on that glass slide. What does that dot of matter under the microscope mean? What do these things mean?—its constitution, its energy as living matter, its subtly co-ordinated and definitely determined processes of division, multiplication, development in one specific direction selected from numberless divergent ways that other cells are taking? By what powers of nature has it been predetermined, by what factors was it held true to its single end, to be a worm *Ascaris?*

Biology has still far more to learn of its chemistry, to trace more clearly its structural lines, to peer, if it may, more deeply into its elemental substance. In such patient research of the biologist it is no business of the metaphysician to interfere with his Absolute, or for the theologian to forestall inquiry with his final

causes; nor for that matter should evolutionary philosophy itself interfere with its own science. Nevertheless, the biologist is a man for all that; and when he looks up from his task, as you and I and all thoughtful people do, and thinks over and all about any observed fact; then he becomes a metaphysician, a philosopher, a theologian, whether he will or no; and the real question, as we think over things, and of ourselves as included among them, is only the question whether we shall be good or bad metaphysicians. Philosophers, theologians of some kind, we all of us at times have to become, we all are made to be by virtue of the inner dynamic of our personal nature; as veritably as that egg has to become a worm of the species *Ascaris*. For us, that cell, as I am speaking to you of it, is not merely a dot of matter that happened to be on that glass slide; under a human eye it became a cell differentiated from myriads innumerable of similar cells; it became a selected cell, holding a definite position and serving now a use not predestined by its natural determinants. It acted upon the retina of an eye at the other end of the micro-

scope, and its impression stimulated in turn the cortical areas of that other, that intelligent optical instrument which a man is supposed to carry about with him in his head. Now, this whole complex situation, I am saying,—a particle of a worm's egg, a microscope, itself made for a purpose, an intricate physiological apparatus, a psychical process, itself mixed with memory images and held to a purposive will; and beyond all this, the idea which just at this moment I am reflecting upon your consciousness, to find, maybe, a lodging-place among your ideas: these things, not to mention other particulars, *taken all together*, constitute a problem of meaning, the problem which no science by itself alone may presume to solve. After the sciences have all had their say, it is the high calling of natural theology to take up their parable; what interpretation of it is to be found by the spiritual man, of whom it was said, he "judgeth all things, and he himself is judged of no man"?

For the sake of an example I have thus introduced to you this acquaintance of mine from the lowly walks of life, the humble worm *As-*

caris—its full name is *Ascaris megalocephala;* it may have something to tell us in our studies of divinity. For if one could discern the last substantiality, the innermost secret of the life taking specific form in that microscopic cell, he might come nearer finding what Tennyson once said all his life long he had been seeking—a new vision of God.

'Flower in the crannied wall,
I pluck you out of the crannies,
I hold you here, root and all, in my hand.
Little flower—but if I could understand
What you are, root and all, and all in all,
I should know what God and man is."

From the wealth of material that the sciences are gathering for a new construction of natural theology another example may be fittingly noticed in this lectureship, for Doctor Nathaniel W. Taylor, had he known it, might have welcomed it in his notable effort to prove that this world, in the place where it is, is the best possible world. I refer to a biological speculation that may throw a gleam at least of light into the dark mystery of the origin of evil and death. That is physically a question of natural science before it becomes a problem of

religious philosophy. It is, accordingly, very much to the theological point to inquire whether we know anything or not concerning the entrance of death into life. Ever the positive of human love is shadowed by the mystery of death. But did death first come to deny life? Biology renders a tentative answer: death, likewise, came not to destroy but to fulfil life. Inquire of nature if this, indeed, be so. I am shown in the biological laboratory a paramecium, one of the unicellular protozoa. Each paramecium, it should be explained, multiplies by division into two, the whole body of the parent cell surviving in the daughter cells. How long can that process continue without death? Some years ago Weissman held in support of his theory of heredity that among the protozoa there is no natural necessity of death. A French investigator, Maupas, succeeded in carrying on the succession for over six hundred generations, but then senescence occurred and life gave up its task. Professor Woodruff, here at Yale, has succeeded in carrying on the line of descent almost indefinitely unbroken by death; it was the thirty-six hundredth paremecium, when I inquired the other day after its

health. The professor, of course, takes one of the two daughter cells after each division to continue the line of descent, himself putting the other to an unnatural end; if he did not, assuming sufficient nutriment could be provided, the mass of matter heaped up by the rapid multiplication of these paramecia in a month would be approximately equal to the mass of the earth, and within the five or six years since he began his experimentation, it would have mounted up toward the mass of the known universe.

On the next higher stage of life—that of the metazoa, organisms of two or more cells—death has entered, and is found with other evolutionary factors at its work. What does it work *for?* The biological answer is not in all respects explicit, but it may be said that it is one of the factors of variation, and that it works for the further differentiation and enrichment of life. Some biologists find the beginnings of natural death coincident with the rudiments of sex. Strictly speaking, it may be said that death appears as an incidental condition in the advancement of life. Subsequently and obviously

throughout evolution death balances the book of account between life's ratio of fertility and its means of living. We owe our human birth to death. We are the living children of a world that has died for us. If, then, we may win from nature any assurance that death itself has its place as a servant in the work of life, that it has its reason for being here on a principle of utility, we may then conceive that death may also be discharged from service when no longer useful; that death may be atrophied in the highest embodiment of spiritual personality; in that consummate realm of life made perfect, where they neither marry nor are given in marriage, its work done, its use ended, death shall be no more—even as already in the Christ-consciousness of life we are passed from death into the life eternal.

I would throw this out, however, simply as illustrating the many suggestions which biological studies bring to minds thoughtful of the outlying mystery of human life and the deep things of God.[1]

[1] The author discussed the natural utility of death in a book published several years ago, entitled, "The Place of Death in Evolution." More recent biological science does not alter ma-

With these brief indications of the wealth of material to be worked over by a thorough natural theology, let us fix clearly in mind its specific aim. Its work is to search for the meanings of things. It is differentiated from other inquiries which may have this end, inasmuch as it starts from the nature side. Its way of approach to its conclusions is through nature.

Natural science as such has only indirectly, while natural theology has directly, to do with the problem of meanings or values. The physicist reaches the limit of his experiments when he discovers how things are so constituted that they must act and react as they do. Natural science is concerned with the relations of phenomena; it need not be diverted from its task to chase through the universe after Kant's "thing in itself." The scientist has no scientific right to have any personal interest in things; he must make himself as impersonal as a man can be in his laboratory; the diagnosis of a physician has nothing to do with his personal

terially the basis for the reasoning there pursued. It has in Professor Woodruff's successful experiment confirmed rather Weissman's view that in the constitution of protoplasm there is inherently no natural necessity of death.

concern for his patient, and he might be misled if it did. So Mr. C. Lloyd Morgan in his latest book on "Instinct and Experience" confines his inquiry strictly to the constitution of animal nature and the behavior of his favorite moor-hen, and he pulls himself up whenever he finds himself facing the question of the "source" of any organic law or habit. It is noticeable, however, that every few pages he has to hold himself back from looking over his physical fences, and that he can not help casting an occasional side glance into Bergsonian philosophy as he goes along his own way. But the saying, "Nature for the nature searchers," is an excellent maxim for the laboratories. As Mr. Morgan has to begin somewhere, he strikes into the way of life at that precise distance from the source where the chick of his moor-hen makes the first peck at the shell, and from that point he traces the development of instinct proper through its modifications by experience and the growth of animal intelligence; he concludes his valuable observations with the remark that it is for the interest of science and metaphysics alike that they should be kept apart.

And so, indeed, it is while we are specializing, and so far we can specialize nature itself. But that will not be long, nor does it go far. Our specialties define our divisions of labor; they mark the metes and bounds of the fields given us to cultivate, but they are our fences only drawn over the common earth, and above them all we look up into the same sky. Indeed, just this is one of the great lessons that the several sciences are bringing home to us, as men have never felt it so profoundly before, that nature is one nature, its history one history, its law one law, and its God one omnipresent Reality.

It is a splendid gift of modern science to modern thought that it demonstrates this unity of nature and our personal oneness with all this "the mighty world of sound and sense," the feeling of which lies deeply in the heart of modern poetry of nature. It is a twofold lesson that we are taught—the discontinuities and yet the continuities of things. Outward objects are concrete, having distinguishable forms and specific characters; yet at the same time they are correlated and in energies continuous. Our

conceptions of things may be analytically determined, like the lines of longitude or latitude which the mariner passes, but which are not drawn across the waves of the sea. There are specific forms in evolution, but our classifications cut not deeply into the substance of outward reality. Common sense sees at a glance the difference between the grass and the cattle browsing in the field, while the scientific eye can hardly discern where the one kingdom begins and the other ends. Our perceptions are broken images, where nature knows no breaks. Events succeed one another, yet as waves of the one underlying ocean. The branch of an elm is etched to our eye against a clear wintry sky; but if it were drawn across the retina of a more microscopic eye, the lines would be a pattern of finer tracery where the twigs of the topmost branches end and the sky begins. Still more subtly discerned with ultramicroscopic definition that pattern seen by us against the sky would resolve into tracery of finest motions; the molecules and electrons having distinctive signs, yet interchanging, rebounding, no longer that sharp definition of

branches, but a waving line of radiances, as a quivering edge of flame—each beginning and ending undefinable as the twinkling of the star in the sky above. Would we seek still to mark the very point, to hold fast the very motion where the topmost twig is twig and the sky is sky, we should need intelligence divine enough to trace these elemental appearances back to their first distinctness as they came forth ethereal whirls of matter; members are these all of one another, both great and small, yet differing in their glory. Has not the keen-minded Lotze taught us that forces do not act at a distance, that one thing is in another where it begins or ends? and Goethe said: "Nature is neither kernel nor shell; she is everything at once." So, as scientifically known, and as poetically felt, the bough is one with the sky, and the sky is one with the bough, though neither is the other. Hence, likewise, for this is the point to which I would return, these sharply separated specialties of ours, our sciences, our electives, our humanities and theologies are useful and necessary for our analysis and work; they are our fixation of that which is given in

the flow of experience, but they are not absolute differentiations; they do not reach down to the vitalities of our personal being. Consequently, we do not know ourselves if we are to ourselves only scientists or philosophers, thinkers or lovers, or any of our specialized kinds of selves; we can know ourselves deeply and all-round only as we breathe and feel and think and love in unison with all that is and lives and loves. The analysis is the task of science; the synopsis is the gift of life. Nor are such observations uncalled for in view of the arbitrary and superficial separations which are sometimes assumed to exist between physics and metaphysics, between the scientific temper and a religious trust, as though the two, science and religion, like the Samaritans with their law only, and the Jews with the prophets also, have no dealings with each other. I have been emphasizing the fact, therefore, that in actual living and thinking they can not help having dealings with one another. To set up either a mechanistic or a spiritual interpretation of ourselves on the single base of either were to raise a broken shaft and to leave no possibil-

ity of the completing arch. We, indeed, with our present knowledge are not able to apprehend the simplification of the dualism of matter and mind in their higher unity, but even in our partial knowledge we may trace some converging lines between the natural and the spiritual, and follow these structural lines up far enough to render reasonable our faith that there is beyond our sight some overarching unity.

Our work, then, in natural theology as thus far set forth, alike as learners and as interpreters of meanings, is at once humble and exalted; it warns us against the presumption either of a final science or a dogmatic philosophy; it bids us cultivate "the modesty of true science" and the aspiration of a spiritual faith. It calls us once again in this generation to a positive work of construction, inasmuch as natural theology, though but as a child among these building blocks of the creation, can nevertheless put together some facts according to some meaning; it may match lines and letters to some intelligible purpose; and as more and more the parts are fitly joined together, and word adds meaning to word, the

belief grows that the whole has significance well worth our knowing—perhaps, when we shall see it as a whole, a simpler, more human, yet diviner meaning than we had thought.

Let me add a few words concerning the value of such scientific studies in natural theology to the preacher. The exigencies of his calling expose him weekly to the intellectual peril of vague thinking and unreal expression. In his sympathies also at all times his mind must be quick to catch the moods of men as a lake does the shadows of the passing clouds. He must desire to imitate the Master in feeling as his own the feeling of every home of sorrow. He needs, then, more than others to maintain a rigorous discipline of clear, consecutive thinking, held closely to the facts. He especially must be on his guard against that common human infirmity, namely, the liability, in thinking, of a sudden gaseous expansion of truth at a high temperature of feeling. As a social leader he will need the mental habit of seeing a wrong felt, or a reform proposed, in its large relations, seeing it clearly and seeing it whole. And as a religious teacher of ideal and spiritual realities,

he must keep firm footing on the solid ground of nature, while he walks with "looks commercing with the skies." Allow me to commend to your use as a most salutary mental discipline in exact thinking the study and the effort to construct for yourselves a scientific natural theology. Schopenhauer speaks of it as "a trick often used by him to advantage, suddenly, when a thought especially inspired him, to turn over it the ice-cold water of critical reflection in order to see whether it would retain its nature and power." I know of no better way of so doing than to listen to some scientific lectures; of no more invigorating cold bath in its reaction for our idealism, for such as are strong enough to bear it, than to take a header, for instance, into Loeb's mechanistic conception of the contents of the inner life, and to come out again into the light of common sense.

But beyond this disciplinary value, which is needed, will be the direct spiritual reassurance and ever fresh exhilaration which the preacher of the word of life may derive from the return to nature.

For him in the increasing illumination of scientific knowledge to become able to lay hold of great creative principles that run on and up from the first pulsations of cosmic ether to the garden, the man of the earth earthy, the second man of the spiritual spiritual, even the Lord from heaven,—oh! this is to receive from nature herself a new baptism of power; and still further to gain some perception that these same constitutive natural principles reach on and on toward worlds unrealized as yet; to discover throughout these preparatory eras of time the real analogies, and consequently true prophecies of the eternal, and, knowing ourselves in our personal transcendence as having part and share in all that is going on in God's great universe, to wait thus in the expectation of the whole creation for the revelation of the sons of God—this, this, shall be for us in very truth to lay hold of the life that is life indeed. And then, with such humble simplicity as grace shall be given us to attain in our preaching, sometimes it may be permitted us to succeed in doing what Jesus himself was always doing, giving

to the least and lowliest his own best and highest truth of God; even as he did those two great things at once in that hour when he gave to the woman at Jacob's Well his own inner truth, so high above her thought before, that God is spirit, while, at the same time, he told her all the things that ever she had done.

II

THE METHOD AND PROBLEMS

IN the preceding lecture it was urged that we should seek to understand anew what the Spirit hath to say to the churches in the progressive revealings of nature. The spoils of the natural sciences wait to be utilized by a new natural theology. In view of the advances of Neo-Darwinism and the fresh contributions of science to our knowledge of evolution, the Apologetics, so called, of faith need to be rewritten up to date. Moreover, the reconstruction of systematic theology, which is desirable, requires a broad and deeply laid foundation in natural theology. It is inadvisable to erect a theological sky-scraper on foundations that are not laid firm in nature. Preachers who would minister to the mind of this generation need the ever fresh inspiration of what one of the ancients called "the Spirit of Education."

That there may be in our time a rejuvenescence of spiritual faith, religion may well go out-of-doors, and with all the elemental forces around and above it prophesy and say of its systems of dogmatics, "Lo, they are very dry. Come from the four winds, O Breath, and breathe upon these slain systems of dogmatics, that they may live."

I proceed next to indicate the method and the range of the problems which natural theology has to pursue.

We exist somewhere midway in the course of nature, our beginnings hidden in the depths of the measureless past ages before ever our members were fashioned, and the end of us beyond our earth-time as yet all unrevealed. Our knowledge—a little span and narrow circle of it—lies in the midst of the flood of the years. But, be it small or great, so far as it goes it has firm footing on fact, and it is real knowledge. It is our experience of what is; and if we are true to that, as it is here and now, we may trust the universe ultimately not to disown us; neither from the beginning nor the end shall come denial of what is now given in our per-

sonal being, and realized in the personal life as having immortal worth.

> "Nature never did betray
> The heart that loved her."

In determining, then, the method of constructive natural theology we have first of all to decide the point from which our inquiry shall start, near which end of our knowledge in the midst of things we shall begin. For no difference between older and more recent methods of philosophic thinking is more marked than just this—the opposite points of their departure. The philosophy of nature of the earlier nineteenth century started from the transcendental view of nature, as Schelling would discover the ideal content that exists in things, or as Fichte's subjective philosophy regarded nature from the point of view of the beholder, making nature a looking-glass of himself. On the other hand, the more modern natural philosophy, since La Place, starts from the mechanical point of view and seeks to determine mathematically the working principles of nature. Simultaneously with these different phil-

osophical views, there grew up the modern naturalistic school of poetry.[1] These two voices, the naturalist's and the poet's, are heard in Goethe; but of all poets Wordsworth, of whom it is said that he never made a mistake in his descriptions of natural objects, has been the interpreter of the interaction of man and nature, as he himself has called it:

> "An ennobling interchange
> Of action from without and from within,
> The excellence, pure function and best power
> Both of the object seen and eye that sees."

The task for natural theology to accomplish might in one aspect be described in these words of Wordsworth concerning the poet's power: "He considers man and nature as essentially adapted to each other, and the mind of man as naturally the mirror of the fairest and most interesting qualities of nature. . . . Poetry is the breath and finer spirit of all knowledge; it is the impassioned expression which is in the countenance of all science."[2] This is what the new

[1] See Merz, "Hist. of European Thought," vol. III, pp. 546 *sq.*

[2] Preface to second edition of the "Lyrical Ballads."

natural theology shall do: interpret the spiritual expression which is on the very countenance of true science.

Where, then, did I just ask, shall we start in search of the ultimate meanings of ourselves and our world? I answer, we are to begin neither with Schelling's philosophy nor with Wordsworth's poetry of nature. Neither shall we go back to Kant and throw the metaphysician's net of categories over all things, to find that the "thing in itself" always slips through its meshes. We must make at the start the candid admission that the mechanists have fought a winning battle with the vitalists; they have traced the mechanical connections throughout nature even into the complicated operations of their own brains. This extension of the mechanistic conception on the scientific side compels us, if we would save our theological souls, to go down ourselves with them to first principles and to reconstruct our psychology and our religious philosophy anew from the bottom up. Now, when the modern mind calls again the leaders to lead in Israel, if the schools of divinity should abide in their

cozy traditions and their comfortable philosophies, like Reuben they would deserve the scorn of Deborah, that valiant mother in Israel: "Why satest thou among the sheepfolds to hear the pipings for the flocks?" Upon their honor as teachers of men who would know, theological leaders are called forth to search for the beginnings of their faiths as far back into the realities of nature as any knowledge can possibly go. Here, at Yale, a school of religion would have no right or reason to stand in the midst of a university, facing its laboratories, unless it could write over its portals the inscription: "All nature-searchers welcome here."

Yes, but you may say, the line of knowledge, as you have called it, on the scientific side is a short one; are we to be tethered in our belief to what the scientists positively know? The answer is forthcoming: speculative thought, pushing out from either end of the known line, the scientific or the religious, the subphysical or the metaphysical end, is as necessary to a man of full-grown intelligence as one of those simple questions which we know not how to answer is necessary to a little child. But spec-

ulative thought in either direction beyond the known is rational only when it proceeds from the same principle, viz., its true extension in the same line as the known, that is, its real analogy. In other words, in both cases, on the scientific or the philosophical side, alike in working theories and in living faiths, as science reaches backward toward natural beginnings, or philosophy presses on toward final causes, the degrees of probability to be given to the views of origins or of destiny will depend upon the same common measure, viz., the extension of thought out into the unknown in the same direction as the line of experience and knowledge already laid down in experience and knowledge. It is by this rule that a real and consequently fruitful analogy is to be distinguished from a fanciful and barren resemblance. The trueness, let me repeat, either of a scientific working theory or a living belief, to the line or curve of experience already attained is the common measure of its probability, the same rule of reasonableness by which it is to be measured. And they who use this method freely at the one end of the scale have least of all right to

deny the same principle of reasoning at the other end of it. Our little life here may be compared to a section of a curve the elements of which are calculable; the arc which it spans is full enough to render possible some determination of its constants, and consequently some conception of the vaster sweep of its curvature, immeasurable though that may be. Hence a physical science or experimental psychology that shall successfully determine any elements or constants of our present experience is to be welcomed as an aid to the religious apprehension of the far-reaching significance of our personal life.

If, then, after this experimental method with the minimum of antecedent hypothesis, the new natural theology shall take up the old problems of faith, we shall not begin with Kant, but possibly we may come back to Kant's reverential awe of the starry heavens and the moral law, having dropped on the way his phenomenalism, escaping also from the dualism of Descartes and avoiding the artificial monads of Leibnitz; peradventure to find rest for our wearied philosophic feet in a per-

sonal realism—if I may thus indicate in a single phrase what a Frenchwoman once asked a philosopher to do: "Give me," she said, "your philosophy in a single word." It would, of course, be impossible to condense within the compass of these lectures the critical discussions or to enumerate even the successive facts of significance which should be considered in the course of the inquiry which has just been indicated; nor would I desire by giving you a too condensed lecture-tablet to occasion on your part any intellectual indigestion. But the studious task required by this method of natural theology may, at least, be made clear. It is simply to hit the trail through nature where best we may, and to follow it closely from sign to sign as far as we possibly can.[1]

Amid the tangle of modern questionings, a student of divinity may feel at times like Dante:

"Midway upon the journey of my life,
I found myself within a forest dark,
For the straightforward pathway had been lost."

[1] This method I hope to follow through in a volume, now in preparation, on the meaning of personality.

But, unlike Dante, he may meet no disincarnate spirit to be his guide from sphere to sphere. He can, however, notice in the pathless forest some mark of seeming insignificance, bits of moss, bended boughs, or leafy growth on one side, showing whence comes the prevailing wind or on which side the sunbeams fall. He may descry a mark that seems not accidental, a blaze on a single tree; looking all around and more intently he may see another, and still another blaze, and wonder if these indicate any definite direction; he may ere long become confident that he is following a real trail and hope to be led out to some clear space. To see the signs, to recognize them distinctly where they are to be seen, and not to give up or to circle around with aimless feet as one hopelessly lost in this bewildering complexity of things—such is the problem of nature and humanity for keen-eyed and strong natural theologians.

Where then farthest back can you hit the trail to-day? Not where the science of the eighteenth century began; not where the science of yesterday stopped. We can not begin

the pursuit of natural theology with Herbert Spencer's biological definitions, which at best are useful only as artificial horizons may be in taking one's latitude; nor shall we begin and end where Huxley's automaton stands like Bunyan's Mr. Facing-Both-Ways; nor can we be content to abandon the search with Darwin's accepted principle of natural selection: science in the Darwinian direction has already penetrated farther into the evolutionary tangle of conflicting forces, and other factors hold up to observation their signs of meaning.

At what point, then, does science enable us to get a positive clutch on anything? Well, just at present the last jumping-off place of physics into the unknown and the inconceivable is the electron. Whatever that may prove to be, from wherever it originated, evidently it came to do something worth doing. It is certainly a very active, and apparently a quite useful intermediary between the ether of space and the molecules of matter. At once it makes its importance felt; it is the first mover in a stupendous work of world-making. Does it give any hint of further meaning? Inspect it

more closely. You will not expect me to attempt to expound the new working theory of matter, which is mathematically intricate, and which is still only in initial stages of verification. When the physicist catches the electron in his laboratory, our interest lies in putting to it the same old question: What sign showest thou? What sign, if any, of former things before you, or pointing toward things to come? We remember that Clerk Maxwell once told us that the atom has "the essential character of a manufactured article." [1] Now these self-illuming radium atoms, and these last electric newcomers into observation, tell us something more intimately of the structure of the materials of which the worlds are made. We are informed that "the existence of masses, which are much smaller than that of the smallest of the atoms of known substances, has been demonstrated in the surest possible manner, and by purely physical methods." [2] These infinitesimals, we are told, with their electric charge, smaller a thousand times than the atom of

[1] "Life of J. Clerk Maxwell," p. 359.
[2] Righi, A., "Modern Theory of Physical Phenomena," p. 127.

hydrogen, are the original building-stones of the heavens and the earth.[1] Moreover, we are taught that these electrons would seem to be the elements of construction of the architecture of the atoms. Therefore it may be admitted that a material atom is nothing but a system composed of a certain number of positive and an equal number of negative electrons, and that the latter, or at least some of them, move about the remaining portion like satellites[2]—a miniature this in an atom of a solar system. Nor is this all that is to be noted. The mass of these infinitesimal particles is measurable, yet it is found to vary at different degrees of temperature; it is hence inferred that its mass is in part at least more apparent than real. Thus substantiality, as we ordinarily conceive of it, to the scientific eye seems to vanish from this first estate of matter. Only a few years ago natural philosophy assumed the existence of cosmic ether, and atoms of ponderable matter; from these it attempted to work out a mechanical explanation of all physical phe-

[1] Rutherford estimates them at 1,700 times smaller.
[2] *Ib.*, p. 151.

nomena.[1] Now, taking a fresh start from the ether and the electrons, it seeks to form ponderable matter itself out of these imponderables, or semi-imponderables. It succeeds, perhaps, in conceiving more satisfactorily in what the electrical current consists, but we know no better what the electrons are which electricity is a current of; nor have we discovered how the primeval cosmic ether ever gave them birth; by what strain and travail of primitive nature were brought forth these electrons by whose unseen hands the heavens have been made. The same authority in physics whose words I have just been citing introduces his exposition of the "modern theory of physical phenomena" with the remark that, in spite of the mystery of electric atoms, "this new theory may perhaps acquire not a little importance in the future, even from the philosophic point of view, since it points out a new method of considering the structure of ponderable matter, and tends to bring back to a single origin all the phenomena of the physical world" (p. xiii). Now that is precisely what I would say it is

[1] *Ib.*, p. 144.

the business of natural theology to do; to observe what discovered things *tend toward;* what nature from the least to the greatest shows as its prevailing tendency: this is our problem all the way along, to follow the trail, and not to lose it. These electrons in themselves prove nothing, but what is their sign? To the physicist just quoted, they bear the sign of one source: they bring to his notice a hint of monism, although that may not, by itself alone, lead so far as monotheism.

Observe some other marks, which will become more noticeable as we pass on. These primal invisibles of matter show at once a remarkable aptitude for combination; and fitness to enter into combinations characterizes further the molecules charged with their attractions. The molecules no sooner exist than they seem disposed to enter into a building trust. Out of the scattered, competing elements of space the sun has certainly formed a powerful monopoly of heat and light, and on the whole a benevolent despotism. In this elemental fitness for combination a sign is given; what order and government of the heavens and earth shall

come of it, only the age-long history of the creation shall determine; but this original adaptability of matter to take form and to develop systems, is prophetic of an ordered universe and its well-being. These atoms of our earth contain reminiscence of their common source, and our fair world is the fulfilment of their prescience of a kingdom greater than themselves which was to come. Had there been an intelligent spirit to observe these atomic elements when they first appeared in space, there would have been potential significance enough in their coming to have caused such intelligence to look forward with expectant wonder to behold some structural idea taking shape and substance in some vast construction. While now we stand gazing into the heavens, to us is revealed the glory of the infinitely great; as we look down into the dust beneath our feet we may understand the infinite significance of the infinitely small.

I pause for a moment at this point to dwell on a new phase of the old problem which is opened by what since Arrhenius's work may be re-

garded as the science of cosmic-physics. Some seventy years ago that acute logician Whewell, in his Bridgewater treatise entitled "Astronomy and General Physics Considered with Reference to Natural Theology," availed himself of the science of his day to show that "a great number of quantities and laws appear to have been *selected* in the construction of the universe; and that, by the adjustment to each other of the magnitudes and laws thus selected, the constitution of the world is what we find it, and is fitted for the support of vegetables and animals in a manner in which it could not have been, if the properties and quantities of the elements had been different from what they are."[1] Since Darwin biology has been so preoccupied with the rôle of natural selection in the organic world that this prior question of the evolution of the inorganic world to be the environment to which life, when it came, might fit itself, has been generally a neglected problem; but the whole biological problem runs directly back into it. Lockyer and others have found spectroscopic evidence of several succes-

[1] Fifth edition, p. 141.

sive stages in the development of the stellar universe, and, as the different color indicates, the evolution of elements in the stars is now an open question. We have thus in the development of the inorganic world what has been called "delayed utility"; the successive stages of inorganic evolution bear the broad mark of prospective utility. To the pre-existence of elemental forms and potencies we owe our existence here in this room just now; and apart from us all these were not made perfect. Recently a physiological chemist, Professor Henderson of Harvard, has put to biology anew this question concerning "the fitness of the environment." He simplifies the problem, and thus renders it more scientifically determinable, by narrowing it to three chief elementary conditions of the matter fit for life on the one hand, and to three distinctive characters of life on the other hand;[1] and then he seeks to discover from the physical and chemical point of view on what law or formative principle the anticipatory development of the former became

[1] Carbon, hydrogen, oxygen (with carbon compounds); and complexity, regulation, metabolism of life.

so peculiarly fitted for the adaptation to it of the later evolution of life. He reaches this result: "Given matter, energy, and the resulting necessity that life shall be a mechanism, the conclusion follows that the atmosphere of solid bodies does actually provide the best of all possible environments for life."[1] He excludes mere contingency in his endeavor to find the formative principle of the fitness of the environment. "There is, in truth," he says, "not one chance in countless millions of millions that the many unique properties of carbon, hydrogen, and oxygen, and especially of their stable compounds water and carbonic acid, which chiefly make up the atmosphere of a new planet, should simultaneously occur in three elements otherwise than through the operation of a natural law which somehow connects them together. There is no greater probability that these unique properties should be without due cause uniquely favorable to the organic mechanism. These are no mere accidents; an explanation is to seek. It must be admitted, however, that no explanation is at

[1] Fitness of the Environment, p. 273.

hand." He asks: "How does it come about that each and all of these many unique properties should be favorable to the organic mechanism, should fit the universe for life? And for the answer to this question existing knowledge provides, I believe, no clew" (pp. 278 *sq.*). So chemistry hands over this promise to natural theology. Can it suggest a clew?

That clew, as religious students and teachers, we are to search out. If we are to meet the modern mind, we shall not be satisfied by bringing a ready-made answer from some once living volume of philosophical theism now laid at rest in the reference-library tomb; still less by preaching with vociferous authority from lecture note-books; not by intellectual indolence shall professional teachers of religion succeed in apprehending the essential meanings of the investigator's facts or in relieving "the torture of an intellect pondering the world problem" in the pew. We, ourselves, must be strong enough to have endured the *pain* of thinking; how can we hope in our preaching to help the suffering of the intellect which another may feel, if never in our theological training or ministry we have first felt ourselves the pain of thinking?

To him to whom

> "The meanest flower that blows can give
> Thoughts that do often lie too deep for tears,"

the clew to the world problem, which the scientist seeks in vain, may be disclosed; yet not to him without wrestling of mind with the unknown One in nature until the day break, and the nameless One is known in the inner revealing of his experience of himself, his Christ, and his God.

A course of natural theology, according to the method just outlined, would lead from physical science next into general biology, and from that on through modern psychology; a critical and detailed review of recent researches and discussions in these sciences would be required for a thorough construction of a new natural theology; a cursory survey only of the rich materials to be gathered and analyzed for this purpose would far exceed our present limits. My immediate object is not so much to present my own conclusions from such studies, but rather to urge the conviction that these sciences are rich in fresh material to be worked over in religious thought, and that they should

be deemed a necessary part of a good theological education; and I would point out the way in which such inquiries should be followed through, as far as reason and scientific imagination can follow them.

A few general observations are at this point not unneeded. A caution should be given to the public in general, and to some preachers in particular, against a too ready acceptance of newspaper or popular science, excepting, of course, any signed articles by recognized authorities. When I notice sometimes the scientific news and still more remarkable headlines in the press, as well as the reports that emanate occasionally through press bureaus from some laboratories, in which experimental work is often magnified into great discoveries, I am reminded of what Erasmus said of certain speculations in vogue in his day: "With such speculations nature must be mightily amused."

In answer to an inquiry of mine, what course in science should be recommended to theological students in their preparation to preach, Professor Chittenden, of the Sheffield Scientific School at Yale, once wrote a letter advising

for the curriculum of a divinity school a course in general biology. That should not be left, in my opinion, entirely to the student's fragmentary reading, or to the remarks of a passing lecturer, but examination in general biology should be required of candidates for the degree of Bachelors in Divinity. Let nothing here be said in disparagement of knowledge of the construction of the language of the law and the prophets, or of the root-meanings of the words in which the Lord conversed with his disciples; but who are we to preach the gospel of life to the people, if we know little or nothing of the grammar of the language of the Ancient of days, which is never a dead language, but which is the word new every morning of the living One?

One thing needs also to be said to prevent religious people from falling into needless panic of faith in view of occasional claims of overconfident magazine science. We should bear in mind that biology, strictly speaking, has to do directly with living matter, not with an abstract conception of life. Vital characters come under observation as connected with matter, and as such the more that can be found out

about them, physically and chemically, the better. It is, for instance, primarily of scientific interest, but not of religious concern, to find out whether or not, as the schoolmen believed, and as biologists do not now hold, life may spring spontaneously from any heap of refuse. We may never know, it would be a scientific joy could we discover, just how, under what conditions, matter acquired the properties which are distinctively vital. And if by any possibility we should ever become able, through more subtle chemical knowledge, from existing materials to start new life into motion, as Loeb and others have succeeded in actuating the existing egg-cell; in such further triumph of science we should only have acquired the power of thinking another of God's thoughts after him. There are, however, two sides of the biological shield. Descartes began a long discussion when he attempted to find a physical explanation of vital phenomena, but as a philosopher Descartes was far from being a mechanist. He said: "One thinks metaphysically, but one lives and acts physically." At present the long-continued controversy between vi-

talism and mechanism seems to have come to a pause very much where Descartes left it; this is the biological paradox: life is mechanical, yet the mechanical is not all of life. The biological paradox, as I would call it, may be reduced to Lotze's maxim: "How universal, without exception, is the extent, and at the same time how subordinate is the significance of the part which mechanism has to play in the building of the world." [1] Similarly, observe also the caution which Professor Ernst Mach gives against the danger of using the concepts of physics as identical with reality: "We, too, should beware lest the *intellectual* machinery, employed in the representation of the world on the *stage of thought*, be regarded as the basis of the real world." [2]

It is true that, as against mechanistic explanations of vital phenomena, the new vitalism of Driesch and others has still tenable ground left on some of the properties of living matter. A cursory enumeration of the chief characters of

[1] "Mikrokosmos," I, s. xv.

[2] "Die Mechanik in ihrer Entwicklung," p. 476; Eng. Tr., "Science and Mechanics." p. 505.

life that resist compression into a cast-iron mechanical conception, is all that our present limits permit; only after a critical study can their vital significance be philosophically estimated. Among these properties is a certain self-affirming energy of the organism. It asserts and maintains itself in relation to its environment. This is something more than the inertia of a body, or the structural resistance of a metal to a strain; it is an organic capacity to maintain itself as a whole by changing to some extent its relations to its external conditions, and this organic adaptability by means of which life survives is not altogether reducible to equations of purely physical stresses. It is more than mere stability of structure, however it may be explained. Thus Ostwald rightly observes that under changes of temperature "life affirms a certain condition, although the influences of the surroundings change," as water does not. "The organism reacts actively, the inorganic passively." He also has happily characterized life as "a lamp that renews the oil which it uses." [1] Another peculiar character of

[1] "Vorlesungen über Nat. Phil.," pp. 314–316.

living matter is the directive power of organisms over their own reactions and motions. To a large extent these seemingly purposive actions among the lower organisms may be reduced to so-called tropisms, or movements to be understood as chemical and physical reactions; as, for example, the flight of moths toward a candle is to be regarded as a result of unsymmetrical simulation of the light to which their motion is a responsive adjustment. But some biologists are not ready to admit that the behavior even of unicellular organisms can be so easily and entirely explained without the recognition of some directive responsiveness of the organism.[1] The capacity of directive responsiveness, which is traceable according to Jennings' studies in the behavior of lower organisms, becomes a specific capacity of animal life, and assumes the character of a psychological fact in the higher stages of evolution.

Together with other vital properties, the organism acquires the character of educability. Living matter in the course of its development shows itself to be educable matter. The or-

[1] See Jennings, H. L., "The Behavior of Lower Organisms."

ganism learns by trial and error; it is taught through acquired experience.

Still another striking mark of the organic is its regenerative power. This characteristic is generally admitted to be one of the unique features of life, most unlike any possible functions of machines, such as we may make. In some of the lower organisms, within certain limits, a single part has power to reproduce the entire organism; a certain regenerative energy therefore seems to be diffused through the whole body. Moreover, the organism as a whole seems to have some regenerative control over its parts. If it is merely a machine, it is a machine having this twofold capacity; it can restore a lost or broken part, and a part of it can remake the whole of it. "A very strange sort of a machine," remarks Driesch, "which is the same in all its parts." The farthest our mechanics has gone is to manufacture machines with exactly interchangeable parts. A curious peculiarity also has been noticed by Driesch, which he calls "retro-differentiation," by which he designates this remarkable procedure: in the process of restoring an injured or lost part,

some organisms have been observed to discard a first-attempt piece, and to replace it by a new part which fits better.[1] This resembles very much a trial process in some efforts of the organism to repair itself.

Passing by several specialized qualities of living matter, another organic character may be mentioned as unique—the power of making preparation for future contingencies.

In a great variety of ways this character is displayed, not only in animal instincts and habits that lead to laying up a store of food for future use, but even more curiously in some instances of anticipatory provision for the benefit of offspring. This consists not simply of the preparation which the parent may instinctively make for its progeny, but provisions seem to have been subtly wrought by nature herself into the very growth and structure of organic forms, by means of which contingencies of which the parents could have had no experience are foreseen and provided for; not a few such instances of organic prescience might be cited from descriptive natural histories. In

[1] *Ib.*, vol. I, p. 163.

the embryonic development of some species, biologists have noticed "structures which form no organic part of the young, yet which at the same time indicate accurately what the young will need at some future time." For example, there is a certain shark-like fish (*Chimæra C. colliei*), the egg of which is contained in a capsule constructed with apparent prevision of the future growth and needs of the progeny. By ten different characters "the egg-capsule was found to be specialized, *i. e.*, adapted for the embryo at a late stage of development. . . . (1) The capsule 'foresees' with startling exactness the size and shape of the young fish when many months hence it comes to hatch out, and (2) it provides a series of progressive modifications adapted to the developing physiological needs of the young." The biologist who has observed these corresponding characters which have thus been acquired in two distinct courses of development, computes the chances for two such favorable coincident variations to be as one in a million; and for three in succession as one in a billion. He says: "Natural selection of fortuitous variations is, accordingly,

clearly valueless in explaining the evolution of the present capsule. The capsule of *Chimæra* must stand, I believe, as an instance of determinate direction." [1]

The argument from these and other special characters of living matter should not be pressed too far. They are not proofs of any theory of the nature of life, but they are indications of some further meaning to be discerned. They do not disprove mechanistic conceptions, so far as it is possible to discover the mechanical means and principles in the constitution and operation of organic nature, but they are indicative of the presence of other factors of evolution, and they open the possibility of their working in and through known chemical and physical conditions. They have further significance to be recognized in scientific investigation; what their final meaning is may be determined only as we endeavor to interpret them in relation to other known facts of higher significance, as we may succeed philosophically to apprehend them in the "to-

[1] Bashford Dean in *Biol. Bulletin*, Woods' Holl, vol. VII, 1904, pp. 105 *sq.*

gether" of nature. As signs of a rational order in nature such characters once so impressed Huxley that he said: "A course of organic evolution is a materialized logical process." To which a Scotch biologist added the remark: "Evolution is a materialized ethical process." And an American biologist concludes a study of regenerative phenomena with these words: "Something more is included in these phenomena, I think, than can be explained by simple physical interaction, or by chemical influences. . . . The process that takes place suggests that something like an intelligent process must be at work." In true Aristotelian fashion he observes, "The form controls the material, and it is not to be physically explained." [1]

The fundamental question between a materialistic and a spiritualistic conception of the organic world is not thought through if we stop with the conclusion that living matter manifests characters and performs work unlike any artificial machines. Professor Loeb admits that "the fact that the machines which can be created by man do not possess the power

[1] T. H. Morgan, "Biological Lectures," Woods' Holl, 1898, p. 266.

of automatic development, self-preservation and reproduction, constitutes for the present a fundamental difference between living machines and artificial machines." He says: "Living organisms may be called chemical machines, inasmuch as the energy for their work and functions is derived from chemical processes, and inasmuch as the material from which the living machines are built must be formed through chemical processes."[1] He holds that nothing contradicts the possibility that these living chemical machines may be artificially constructed. He would offset the chances against the natural evolution of living machines by the probabilities that an innumerable number of failures must have occurred in nature's constructions, while we know only the fortunate successes.[2] When hard pressed with difficulties the mechanical theory can always take refuge in Loeb's saving clause, "for the present," and answer that in the experiments of countless ages nature may have turned out some surprisingly fine products.

Moreover, the fundamental question of the

[1] "Dynamics of Living Matter," p. 1.
[2] "Mechanistic Conception of Life," pp. 24 *sq.*

meaning of life is not thought through, if the reasoning stops with the apparent specific distinctions between inorganic and living matter. There must be one measure of value and the same final interpretation for both. Natural theology puts itself at stake on a side issue, if it would risk all on the assumption of a creative break between the two. Loeb may rightly reply that if, as he holds, the durable chemical elements are only the product of blind forces, then he is justified in affirming, "there is no reason for conceiving otherwise the durable systems in living nature."

The search for the real meaning of the world must follow things through as one connected course, and the reasoning must not stop abruptly at any part; only so far as we can gain a world-view in which all the parts are seen in their correlations, and when taken together as constituting a rational whole, shall we gain reasonable assurance that our thought apprehends the reality of being, that we know indeed, though as yet but in part. Here we may apply the old maxim of the Greeks, and beyond all the mechanical means and principles of nature, "Look

to the end." The values of the end-product may tell the whole story of nature; what is the final product like—is it godlike? What is our personal life worth living *for?* By whatever mechanical means or elementary courses, has something eventuated which has value not mathematically calculable, something qualitatively good besides being materially well put together? The true interpretation will come back from the end of the whole story. Which is the explanation of the other—the material of the mental, the mechanical of the ethical; or is the end-result of mind and moral value the interpretation of all that has been before it from the beginning?

At this point, therefore, in a natural theology that would follow closely the way of nature's progressive self-revelation, we are content simply to say that these significant phenomena of both inorganic and living matter, which we have thus rapidly surveyed, are not in themselves proofs of any theory of nature, but that they give an impression of thoughtfulness in the constitution and processes of nature, and that they are suggestive of some immanent,

determinate direction in evolution, although not by themselves finally demonstrative of intelligent guidance. The presence of some "unknown factor" in nature is everywhere to be felt; that factor seems to indicate some energy of mind in forming matter, an energizing that is superhuman, but not necessarily supernatural. By whatever means wrought out, nature seems to have been first thought out. For the real and conclusive interpretation of evolution the last question to be determined is: whether of every living creature the prophet Ezekiel's vision holds true or not; whether the mechanic who sees the wheels only, and figures out mathematically the laws of their motions, sees all there is within the wheels to be known; or whether the vision also of the Spirit within the wheels is true insight, and their higher law is, "Whithersoever it moves they move."

The next part of the path which from sign to sign of meaning I would point out will lead us to higher ground, and leave us before the supreme fact in nature of the personality of the Christ.

III

CHRIST AS FINAL FACT OF NATURE

BEFORE leaving the biological field and approaching the subject of this lecture, I am asked to consider a question which may remain in some minds. Those who are accustomed to regard life as something wholly apart, manifesting a distinct vital force, will at once say: If, with the biologists we are to speak strictly of living matter, should we not also speak of thinking matter; and if so, when the matter goes, does everything go with it, and what of us would be left? Well, that is very much the way in which years ago Pascal in one of his profound thoughts did speak—it is a famous passage: "Man is but a reed, the weakest in nature, but he is a thinking reed. It is not necessary that the entire universe arm itself to crush him. A breath of air, a drop of water suffices to kill him. But were

the universe to crush him, man would still be more noble than that which kills him, because he knows that he dies, and the universe knows nothing of the advantage it has over him" (ch. ii, x). In the living matter, in the *thinking* reed, is contained the potency and the meaning of the world.

Besides what was urged at the close of the last lecture, in a somewhat different way let me put the answer which in accordance with biological science may be given to this question. It may be stated more concretely as follows: Here is a loaf of bread, we will say, existing to be digested by a man. Suppose the universe likewise to be given us to be understood or mentally digested; there is this difference, however: when a loaf of bread is before us to be examined, we are outside of it; we are, that is, philosophically speaking, transcendental to the loaf, and we may find out who made it. But we are inside the universe, and it is inside us; to know what it is, and what we mean, we must take ourselves as immanent in and parts of it. We may not hold it up before us, and look outside of it for its

Maker. The older natural theology took up the world-problem, like Paley's watch, as something external which the observer found to examine; modern science does not take up the problem in that way. Our position, as scientifically conceived, resembles that which the watch might be imagined to assume if it had somehow become conscious of itself and wondered what it was, and what the time meant that it seemed to be keeping with every tick. Our living, our thinking, to put the comparison broadly, is as though the yeast in the bread, or the enzyme in its digestion, had become aware of itself and its action, and wondered what it was all for; or as though the mainspring in the watch, becoming conscious of its energy, began to speculate concerning what all the mechanism around it meant. This is our position and our problem of knowledge. How, then, does the scientist attack this problem of the world's knowledge of itself in his knowing it? He replies, it is for us to investigate how it works, what it is made of, and how the things put together in it behave toward one another. And he has been finding that

out. He is learning every day something new as to how things work, and work together. That is what Professor Loeb did when he started up an unfertilized egg, and, exhilarated by his own access of knowledge, jumped to the conclusion that some day we may know it all; very much as Democritus of old once said, "I am about to speak of all things." The biologists, a laborious multitude of them, are searching farther and deeper, and at every step they find more chemistry and more physics; but they do not find any other specific force in their analysis of the phenomena of life. Thus, Mr. Thomas B. Osborn, at the experiment station here in our city, for many years has been industriously picking out different proteins from grains of wheat and other foodstuffs, and trying them with interesting and valuable results on white rats; and with each result of analysis he finds further intricate problems of physiological chemistry to be worked out. Slowly but surely positive science is extending our knowledge over the field of vital phenomena; it is an indefinite regress of knowledge in this direction; but less and less with this exten-

sion of knowledge grows the space where any such specific energy as a vital force may be discovered. Indeed, the biologists generally no longer trouble themselves about it any more than we do about ghosts. What then? Is it all over with us? Is the discovered mechanism of the universe nothing but materialism? Do the mathematicians compel us, as Mrs. Browning puts it, to apprehend God himself

> "As the bare result
> Of what his hand materially has made,
> Expressed in such an algebraic sign
> Called God;—that is, to put it otherwise,
> They add up nature to a naught of God,
> And cross the quotient."

Nay; the very success of our knowledge of the mechanism of nature is the failure of an interpretation of it as materialism. It excludes any fortuitous explanation, and compels acceptance of some rational principle in its interpretation. The more the working parts are understood, the less as a whole does the mechanism explain its own existence. The decisive point is not that one part is inorganic and another organic; it is not the fact that one

order of nature sleeps in seeming unconsciousness of itself, while another has awakened to awareness of its activities; nor is it the fact that, as far as we can see, no breaks or interruptions occur in the course of nature: the point of decisive significance is the constitutive fact of formative motion, of motion taking form, of form determining motion; it is the wonderful fact that, taken all together, nature has significance becoming more significant the better we know it, and the more we are learning scientifically how all things work together for what seems to us to be good; it is the outstanding fact that the universe—suns and stars and all—just here at least on this little earth, has come to awareness of itself in our conscious thinking of it: this fact it is which the sciences, looking up from their successes, give over for interpretation to the man to know who knows himself. Among these proteins and enzymes, of which his bread of life is made, he has become aware of the meaning of himself to himself, and in the light of his own being he would discern the meaning of his world. In other words, it is not the things known, but the *know-*

ing them; not the things formed, but the *forming* them; not the world apart from thinking, but thinking immanent in the world that shall yield the secret of the essential truth and being of it. As both pupil and heir of all the sciences it shall be the burden and the joy of the theologian of nature to seek for this essential truth of being as nature's hidden treasure.

Aristotle, with his penetrating distinctions of matter and form, may help at this point to clear up our thinking. When the eminent German biologist, Driesch, comes to the crucial point of his elaborate discussion of the "Science and Philosophy of the Organism," after all his analysis and systemization of the results of biological research, he falls back on Aristotle's conception of things that have their forms or ends in themselves—their so-called entelechies. As a man of science, in his philosophic interpretation of the organism, he takes his final stand on this entelechy of nature, not indeed against mechanistic knowledge of vital phenomena, but above any materialistic theory of the organic world that would reduce it to an unintelligible heap of things.

To put, then, the whole matter in a single antithetic sentence, the first question is not how things have happened to get into form, but why form ever got into things. And the last question is, not for what purpose did things get themselves into such good form, but what the form actually found to be existent in things is good for. In fine, the interpretation of nature is a question of formative motion at the beginning and of human values at the present end of evolution.

In the method of inquiry which I am outlining we should pass next into the domain of modern descriptive and genetic psychology. But here likewise the literature is too extensive to permit of a critical review within our present limits of the evidential value of the facts bearing on our line of reasoning from sign to sign of meaning in the course of nature and human history. Passing over, therefore, without so much as a cursory survey this portion of the inquiry which the new natural theology must thoroughly investigate, we confront the last, best-known fact in nature—the final fact of personality. Its consummate realization is the person of Jesus, the Christ.

From whatever point in nature or in human history we may choose to start, if we follow the way through, we come out at length in full view of the supernal Christ-fact of personality upon this earth, above all others, positive and pure as the Jungfrau among the Alps, ascending till its summit is lost from sight in the glory of the evening cloud.

Does it seem a venturesome attempt to approach the person of the Christ from the nature side, and to read the meaning of human life in the personal consciousness of Jesus? Yet the Son of man has his place and hour in the continuity of nature, and his life is moment and part of human history. Nature itself leads to the consummate Man. And the inner consciousness of the perfect man throws back its light on all that has been before him. So far then as we may enter into the self-consciousness of Jesus, we may enter more deeply into the significance of our own life and of the whole course of natural development from which we have come to be ourselves. Personality, ours and his, is to be finally interpreted in the light of the Christ of nature, the Christ of history, and the Christ of experience. Either part of

this interpretation is incomplete without the others. Separate these three primary aspects of the person of Christ entirely from one another, and we break the perfect simplicity of the Light of the world.

In pursuing further this inquiry, natural theology runs over into revealed; but the point of view will be retained; from the nature side, and as involved in the course of nature, we look to the Christ of history and experience as the end and final meaning of all the way of evolution. Both the man of science and the man of faith have right to stand on holy ground. When Moses saw the burning bush, he was a natural scientist when he said, "I will turn aside now, and see why the bush is not burnt." Moses was a religious man when from out of the midst of the bush he heard God calling him, and he hid his face, for he was afraid to look upon God. Mrs. Browning says "every bush is aflame with God." If, then, we turn aside with our science to see how out of the midst of the natural there appears a flame so divine, we shall find ourselves in a presence that is a revealing light in nature, yet as the

flame that does not consume. Moses quickly forgot his question, Why? in that Presence; we may the more readily receive the revelation if we shall have discerned that the material world is made for the indwelling of the spiritual, and how naturally from the midst of it the unconsuming flame shines out. It is with such reverential desire that natural theology approaches the holy ground of the Christian theophany, and asks what sign does it give? As final luminous fact in nature, what is the meaning of the potential personality of the Christ?

This, our modern question concerning the Christ, is primarily one of dynamics—the dynamic of his mighty personality.

The fundamental problem of natural science concerns energetics: What in the last analysis is the energy of nature? whence its source? Give me matter and motion, once said a philosopher, and I could create the world. But that is the rub; give us matter in motion, and one might imagine how on mechanical principles much might be created. But a third postulate would have to be granted in order for us to imagine how such a world as ours could have

been made: give us matter and motion, and also form—form-giving motion—and it would be easier to conceive how the world was made. All the way along the first and the last question of the philosophy of evolution is the dynamical interrogation, whence and what are the potentials of matter, of life, of animal intelligence, of humanity? And with this question at the heart of our scientific knowledge we turn to the mighty working of the Son of man, the dynamic of the life of the Christ in the world. What is its source, its kinetic manifestation in history, its conservation in the Christian consciousness? What presence of God is this? The yesterdays of creation were potential with it; the to-day of the personal influence of the Christ knows it supremely; the to-morrow of humanity shall fill up the measure of this divine dynamic in the history of the world.

The cosmic problem of a divine dynamic confronts natural theology when, having still on its lips the final question of the sciences, it draws near and inquires of the Christ, What workest thou? what sign through the centuries

dost thou give? Think not that lightly or by a ministry of unstudious popularity this question can be answered to an age that never more seriously than now lifts up its supreme doubt to the supernal Man. It is the call of the Christian ministry above everything else to know Jesus Christ and him crucified; to know him not only for the man on the street in his struggle with the world, but to know the Christ for the solitary man in the vigil of his intellect in the mystery of life; and you can not know your Christ, as he waits for men to know him, save as you yourself shall first seek to behold him, him only, him supremely, as he stands in the midst of the sciences, fulfilling all knowledge in the higher Verilies of his consciousness of God.

In order to gain a clearer appreciation of the potential personality of Jesus, one should not fail to observe the natural possibilities of new influx of power, and of marked accelerations likewise of spiritual energy at favorable points in a chosen line of descent. A cumulative heredity at times will knot threads of life together in a strong personality; or, like

the sudden mutation in De Vries' primroses, creative of a double flower, unexpectedly a spiritual genius may blossom out. We are far from knowing the full measure of the power of mind in and through matter, and the natural potency of the human spiritual energy may be more dominant and farther reaching than our sciences have as yet followed or can verify. Psychology of late has been pushing farther back the limits of personal experience around the whole field of consciousness, throwing it open to influences from far and near, from the superconscious as well as the subconscious; so that one can hardly tell nowadays just where he himself in any direction does begin or may leave off. In very truth we are every moment our finite selves in the presence of the infinite and the eternal. From a thorough appreciation, then, of the immense personal potential of man's being, with its future possibilities to which our present limitations may not set bounds, we are to approach the potential personality of Jesus, the Christ.

We shall thus have learned how, in the cradle of natural tendencies and conjunctions, a new

power may be nurtured, a new will sent forth to do some will of God. It is with no irreverent curiosity, therefore, that natural theology will ask what may be said concerning the psycho-physiological preparation for the advent of Jesus. For this purpose those scribes who kept the book of his generations may have been guided by a more far-sighted wisdom than they dreamed, and for our information have wrought better than they knew. For to us, children of this scientific age, these genealogies give Jesus a chosen place in nature's line of promise; they serve to bring his spiritual ascendency from his birth more profoundly into harmony with natural law; not without the coworking of natural *selective* agencies was the way prepared for the coming of one who should be born the spiritual king among men.

In this connection a word should not be left unsaid concerning the narrative of the virgin birth. We leave to the biblical critics the question of the origin of that belief; very likely it may have been one of the earlier afterthoughts of some of his disciples concerning their risen Lord—their reflection back upon

his nativity of their knowledge of his more wondrous life. Nor from our present point of view are we concerned just now with the substance of the faith underlying the words, "born of the Virgin Mary." It lies beyond our province to discuss in passing how rightly we should use in our churches the ancient symbols of the faith—not, indeed, in slavish literalness, but as that great protestant Chillingworth did, when he wrote beneath his subscription in the parish registry that he signed them as the bonds of peace. And with all the associations of art, of purity, of prayer, and holy devotion of the saints, gathered around that name, the Virgin Mary, his would be a reckless iconoclastic hand who would strike it from the Christian's common creed.

Natural theology, however, is directly concerned with the significance of the advent of Jesus as a historical fact. Considered in this light, it is to be observed that the tradition of the virgin birth is neither capable in itself of historical proof, nor would it, if provable, by itself alone prove anything of indispensable value to faith in the spiritual origin of all life,

or in the Incarnation. It might, on the contrary, add an exceptionable difficulty to the belief that Jesus' human heredity was such as ours. Whether, indeed, before ever his members were fashioned, as afterward at his baptism, there may have been an unusual descent of the Spirit, an influx of spiritual power which is beyond our apprehension, but not beyond the capacity of nature to receive—this is matter for speculative religious thought. But if he is indeed the Christ, whose coming interprets nature and history, and by whom the thoughts of men's hearts are revealed, then he must have been a man like us; he could not have been the man he was unless he had entered into the full inheritance of our human nature. And surely the life of Jesus showed the union and the perfection of both the manly and the womanly of his heredity from a line of kings and from the mother who was blessed among women; for, in his personal authority and in his wondrous personal attractiveness, he led strong men to leave all and follow him, and drew the little child from the midst of them to come to him.

His disciples tell us nothing of the Master's appearance, as we would like to know how he looked, what light was in his eye, what power in his presence, when he spake some of those words which, once spoken, have never since been forgotten. But from some minor indications of his personal impression upon men, as well as from what is narrated of the works, taxing human endurance, which he did day after day, we may infer something concerning his perfect physiological preparation, the consummate organization in him of body and mind, for the exercise of sustained spiritual energy, for the going forth to others of the virtue that was in him. The disciples, said Peter, followed no cunningly devised fables when they made known his power and his *presence*. His ministry of healing also—a subject which I will not now venture to discuss—may bear witness in the light of further psychical knowledge of the natural to the renewing virtue of the Spirit when raised to its highest power in a perfect personality.

Furthermore, in order that we may behold Jesus as he is in the midst of natural forces and

laws, we shall need to study his life in relation to whatever historical criticism may enable us to know of his immediate environment. In this sense biblical criticism, though not an exact science, may rightly claim a place among the sciences. Natural theology must avail itself of these studies likewise in its final effort to discover the meaning of personal life in its highest realization in the self-consciousness of the Christ. Sooner or later, to this ultimate issue all our knowledges must come out: How are we to apprehend ourselves in Christ? What is the personal value as it is realized in the ideal personality of Christ? Our interest at this point, however, is not theological but epistemological; for no theory of knowledge can be complete unless it shall apprehend the knowledge of self, even as we are apprehended in Christ. So far as our consciousness has entered into his, and his has filled ours to the full, will our theory of knowing be true to the whole truth concerning the nature of knowledge.

Moreover, in such endeavor to know ourselves as we are known in Christ, and to esti-

mate the value of personal life in Jesus' consciousness of its worth, we can not separate the Christ of history from the Christ of experience. It is not true to the manifestation of the Spirit which is given in him, when we put the question—Jesus *or* Christ? For the historical Jesus is the potential Christ of history. Jesus is himself the creator of the ideal Christ. We mistake no illusive feeling of our hearts for spiritual reality; we lay hold of a law of personal energy as unbroken as the law of conservation of energy in nature, when we hold it to be true that Jesus Christ in his life on earth must have been, and was potentially in his person, all that he has become kinetically, and is, and shall continue to be in the life of the world. Scientifically stripped of the legendary, contemplated in the cold light of searching historical criticism, or discovered, as nothing else finds us, in the immediate response of our life to his, the personal influence of Jesus abides always with us; the Christ is to-day as always the spiritual dynamic of the world. If, then, our previous studies of genetic psychology shall have left us with the conviction that the evolution

of intelligence has not been itself an unintelligent process; that nature has come to itself as spirit in the free personal selfhood of which we have entered into possession—then this spiritual meaning of our being will come to its final and full assurance in the Christian consciousness of life. Jesus' transcendent personality raises above a merely materialistic estimate the worth of human personality. Biblical criticism leaves the Christ as the original source of the disciples' faith, the ever-present vitality of his church, and the revelation of the spiritual worth of man, even as the glory which he had received from the Father.

Let us glance briefly at two significant aspects of Jesus' life, still beholding him as he stands in his luminous personality against the background of nature.

First, it is to be said that the mind that was in Jesus reveals in its transcendence the ideational energy immanent in personal being. That which psychology has to account for is not merely ideas, but the power to have ideas. Thinking is an act; it is energizing. This thinking energy, among all the other forms of

energy, is the primary fact of mind in nature; here, likewise, as in the supposed cosmic ether, it is the motion, the energizing, that mere mechanistic conceptions leave out of the account. The spiritual energy of the mind that was in Jesus reaches through the generations, and of the increase of its dominion there is no end. It is natural, yet it is supernal. It is human thinking, yet spiritual beyond measure. His thought is the energy of mind raised to its superlative.

The spiritual energy of mind, which scientific psychology has to apprehend as a fact of nature, is manifested at its height in the method of Jesus' thinking, and by its stupendous power in creating the Christian consciousness of life. Nature in her fields and flowers gave to Jesus, as to other men, materials for parables, but in his thinking at once they took form and became parables of the Spirit. There is in his teaching a penetration of intuition, a clearness of vision, a spontaneity of expression, an immediate sense of reality, which have made him the spiritual authority of the world. From the infinite deeps of his God-consciousness truths

shine out above all controversy supernal as the stars.

If, indeed, as we have followed the sciences through the way of nature up to man we had observed no indications of meaning to lead us on; if we had discerned no signs of intelligent direction pointing toward some spiritual supremacy; and then if suddenly we had come out before Jesus Christ; if thus unheralded and unexpected Jesus himself had appeared amid all the unintelligibleness of an aimless world; then would he be a miracle contrary to experience, and his God-consciousness seem an incredible revelation. Such instantaneous flaming forth in a mindless nature of the mind that is in Jesus might be a surprise beyond all understanding, a marvel of mind so supernatural that it would not have left the natural unconsumed. But our Christ did not so come, and his divineness does not consume his naturalness. Jesus, thinking his thought of God, nay rather Jesus thinking his thought *with* God, is come to fulfil all the law and the prophets that have been before him since the beginning of the world. To this day his mighty working is

not all told in what men of old bear witness that he began to do at Cana of Galilee. Hovering above our city, his thought of it, for such as have eyes to see, over all our wronged and troubled earth, is his vision of the kingdom of heaven. He has made that real for us. His spiritual achievement is the prayer which he taught the world to pray, Thy kingdom come. The power which was in the mind of Jesus to behold Satan fallen from heaven when his disciples told him of a few slight successes in his name, his power to behold the hereafter as God in heaven knows the eternal realities, the light within him of the new heavens and the new earth; this is the final and supreme achievement of the Spirit which is in man. To him it was given without the measure which our little sciences can measure. The Lord's prayer is itself a deed done, a mighty work accomplished. When he taught his disciples to pray, Thy kingdom come, Thy will be done, an act of spiritual power was achieved, a dynamic of ceaseless energy entered into human history by the word of a man made in the likeness of God. When his disciples continue repeating

his act of prayer, and feel its quickening power, they live in his life and see in his light.

The other aspect of Jesus' final interpretation of personal life is to be observed in the power of his will to live—the potential energy in him to live his Godlike life among men.

All that we know of the meaning of that word energy in outward nature is derived from its meaning to us in our conscious willing. The idealist has here the last word to speak to the physicist, as he affirms that the will to be as an individual is the ultimate unanalyzable actuality of existence. There is nothing given in experience more fundamental, more creative, more constant than the personal will to be. It is not separable from thinking; only in reflections, not in the act of reflecting, can the will be isolated as an object of consciousness. It is pervasive and active throughout our knowing ourselves and our world. This will of man to be, this energy of the personal will to live, is made manifest in its immortal potentiality in the will of Jesus to live as the Son of God. By it he overcame the world. And the unconquerable force of the Christ-will to live has become

the victory over death in the consciousness of generations of men, who in joy of sacrificial devotion and in serene assurance of the power of an endless life have willed to lay down their lives and to take them up again with the Christ. Death itself, in Jesus' knowledge of it, was a part, a moment, an act of his living; dying was living into new life, not a hopeless defeat suffered, but an action and a victory achieved. To die is not merely something to be suffered; it is an act to be accomplished. So death in the Christian consciousness of dying has sometimes seemed to be, as we may hope some day to experience it to be, not a mere passive passing, a suffering endured, but an act of passing into life beyond life,—at the last an access of spiritual strength never so realized until then, a conservation of happiest memories in a happier beginning of life's completions, a sense and vision of divine reality brightening into knowledge—even as for some whom we may have lost from sight for a little while the veil seemed to have been lifted as they passed into the invisible Presence in which we unseeing, and they henceforth beholding, live: as the perfect Man

knew full well that his God and ours is not the God of the dead but of the living, and his disciples, having once known him, were henceforth well assured that whether we wake or sleep we live together with him.

It would require a long chapter and a critical study of biology and genetic psychology to gather the materials and appraise the evidential value of the argument for immortality from the progressive evolution of nature and personality up to the Christ-consciousness of man. This, likewise, is part of the work of natural theology waiting to be done. Enough now to point only, as I am doing, to the unmistakable sign of the meaning of personality in a realm of ends which is lifted up in the will of the Christ to live the eternal kind of life. That personal will, as it was manifested in superlative power in him, and as it works mightily in the Christian consciousness of life, is not a mere ideal creation, a speculation, a fond human hope; it is a fact, a fact among other facts of nature, as really so as any magnitude to be measured in the laboratory; the science of evolution is incomplete should it fail to recognize

the Christ-fact as reality to be accounted for in a final natural philosophy. And at the end of all knowledge, the last sign of meaning pointing still on in the same direction into the unknown is—*Immortality.*

In the presence of the consummate Man we ask again the same question with which we began, What is the worth of a man's life? We ask of the Christian consciousness, of which he is the creator and the light, What is the full significance of the world? Does nature have any discernible meaning? Is the nature that we see a palimpsest, written over with our ideas, but when stripped one after another of our impressions in itself a blank, whereon is nothing of meaning, no line of reason, nor word of the eternal? Or is it a scripture which we may read in part, discovering on its unfolding pages thought answering to our thought, and seemingly some far intent, running through its successive chapters, and waiting still to come to its conclusion? Has all this fair world we love no secret of divinity at its heart? Is every expression of the Spirit that prophet and poet

see passing over the face of nature but illusive reflection of their thought; or can it indeed be their finer discernment of some indwelling Presence, which would reveal itself to those who have hearts pure enough to see? So one may put the ultimate question of reason and of faith.

Go back, then, once more with our question of the sign to the beginning—as far back toward the origin of things as the most adventurous science may go; then look to the end—as far toward the end as the vision of the transfigured man, the ascended Christ, may suffer the most worshipful faith to gaze into the heavenlies. The way of the æons between let science measure as it may—the materials, the powers, the mechanics of it from age to age; but the beginnings and the end, the origin lost from sight far away, and the glory at the end vanishing into the ineffable—of these what science can tell? Put the beginning in closest contrast with the end; that star-dust concentrated in our sun, that mind-dust, as Professor Clifford was wont to call the earliest gleams of intelligence in nature, in contrast with the

final luminous Christ-consciousness of God; put that least living cell in its vast potentiality beneath the eye of the mind that knows it in its very place in a living order; nay, put that cell in its unconscious prophecy of futurity beneath the eye of the Christ who knows that nothing falls to the ground without the Father's notice; consider the way of life, what it means, from *it* to him, to him in his consciousness of the mystery of the Godhead—the distance passed, the end attained—the mystery of divine personality revealed—the life manifested in the fellowship of the Father and the Son, for in reality our fellowship is with him. Our God is one God; nature is one revelation of the Spirit; we are made partakers of the divine nature. In the beginning was the Word, and the Word was with God and was God. We have seen his glory, glory as of the only begotten of the Father, full of grace and truth. Such the new natural theology may find to be the world-view, which science leaves open to faith, but itself may not enter. Yet there is a spirituality of the scientific mind, of which I shall have somewhat to say in the next lecture.

IV

SCIENTIFIC SPIRITUALITY

I ENTER a laboratory and stand by a window, while a man of science at his table is conducting some research. He can not allow himself to look out of the window and let his mind wander far and away; his eye must be fixed on his instrument of precision by means of which he would measure a wave-length, define a microscopic object, or catch what he can find in a vacuum tube. Any theological observation of mine would be an interference with his work as a nature-searcher. And when he has finished and made careful note of his observation, he has with the same precision to regard the fact he has observed in its connection with other facts previously discovered, and to verify his observations by repeating them and by control experiments; still further, he must think the facts observed over and over in

all possible relations, grouping them and putting them together in some unifying conception, that he may thereby recognize the method or law of nature which their mutual behavior discloses; and then his work begins again, for he must apply that mental conception to some other research, going back with it to nature once more, and using the knowledge thus acquired as his working-creed in the reasonable hope that thereby he may push human knowledge a little farther out into the alluring vastness of the unknown. And here again he has to exercise renewed self-control, lest his working-creed becomes an obscuring dogmatism, and his mind may not see what nature itself next would open to his understanding. In this he affords to us students of divine revelation a most excellent example. This scientific work and sustained mental attitude require rigorous intellectual discipline and compel the man of science in his working hours to put all sentiment or personal opinions behind him. He might not like to have one of us write over the door of his laboratory the words which Dante saw written over the Inferno, "Abandon hope,

all ye who enter here"; but once in his workshop he himself as a true man of science, for the sake of the truthfulness of his work, is under exacting obligation to shut out from his mind the sentiments, personal opinions, or beliefs of any kind that might cast an interfering shadow even over the clearness and accuracy of his observation. Very naturally, therefore, this necessary habit of keeping thought close to the fact, and of admitting nothing incapable of proof, may not predispose a thorough scientific man to a confession of religious beliefs, although it may cause him to realize most profoundly how small is the extent of the things that can be proved, and how large is the domain that must be possessed by faith.

But while the investigator is thus intent on his immediate object of research, I, who have stolen into his laboratory, while watching him in his experimentation, may glance out of the window, and into the distant sky, seeing there nothing that has form or substance, not so much, perhaps, as a passing cloud, only a far horizon line and a vacant expanse and depth of blue. But, remembering what the worker

at the table, and many before him who willed to know, have taught me to know, as I look over his shoulder out into space and let the thoughts come to me that may, that vacant vista of light suddenly changes into a scene of fascinating interest, a field of intense activities. That emptiness of space is peopled with a heavenly host of radiances innumerable—regiments and lines of contending forces sweep across it; swift emissaries from all the thrones of light appear in those depths of blue; potentates, principalities, dominions of solar systems, the great world-powers surrounding this little earth, are met to make for us God's peace in the quiet of that evening sky. What does the man of science at the work-bench care for that? Nothing, perhaps, just at that moment; he is using his imagination to enable him to see a little farther into the wonder of the thing before his eye; I was simply letting my imagination, as we all at times must do, render more real to me the realities of the deep things of God that no eye can see. It is the same power of imagination, the same power of mind over nature in both of us; exercised in either way,

it has the same right and reason to lead us on, and out, and up in the love and the pursuit of truth.

The day passes; the scientist and I walk homeward together. Unconsciously, unconfessedly, we both may have learned in different ways much the same lesson, he intent on his labor, I gazing idly out of the window; for neither of us by searching has found out the Almighty, and he very likely, as he closes his laboratory door, leaving there his work unfinished, may have realized more deeply than I how God's ways are past finding out. To each of us another lesson, deeper, more human, diviner, may have come unsought on our homeward way; and to him perhaps most needful, as his little child runs out to meet him and he enters the door of his home—the lesson of God which Saint John had learned from his Christ: "We love because He first loved us."

There is a scientific type of spiritual-mindedness; and of its worth and use some things may fittingly be said in this school of religion.

It is to be recognized as a definite variety of spirituality that has been formed in the envi-

ronment of Christianity. Consciously or unconsciously it has grown and bears its fruit under the influence and in the light of the Christ. This spiritual type has its Christian heredity, determinant of its character, which it may modify in its individuality, but from the formative influence of which it may no more escape than any transmission of life may from the Mendelian law of dominant characters. It is, then, with the scientific spirituality that draws the breath of its life in the atmosphere of religious idealism and develops in the environment of Hebrew-Christian faiths, that we have to do.

It is to be differentiated from several well-known forms of religious experience.

It is to be distinguished from that kind of spiritual apprehension which in general may be designated as mystical. It is not characterized by immediate mystical vision. The scientific mind night after night will search the heavens with the telescope; but it could not keep the saint's lonely vigil until the narrow cell should be flooded with ineffable light.

Neither does this kind of spirituality wear

the sign of mystical pietism. It waits not with Tauler on God; nor with Madame Guion in the still hour is it lost in contemplation of the divine. It would not for a moment allow its mental energies to run to waste in the placid diffuseness of the so-called "new thought" literature of our time. The scientific mind is an active intelligence, every morning off on the hunt, keenly observant that no least sign may escape it, and careful to prevent its compass from being deflected by any personal belongings. The scientific man can not be expected, then, to sit still under unscientific preaching, and to know God. Rather under such preaching he might recall a word of Pascal—that profound thinker who at the age of sixteen had composed a little tractate on conic sections, and at twenty-six had made brilliant experiments in hydrostatics and pneumatics, and who then abandoned a splendid career in science to become a religious recluse and to produce his immortal Provincial Letters—this word of Pascal which any of us may well bear in mind in the preparation for our preaching: "Our whole dignity consists, then, in thought. Our

elevation must be derived from this, not from space and duration, which we can not fill. Let us endeavor, then, to think well; this is the principle of ethics."[1]

The scientific type of spirituality is to be distinguished also from transcendental intuition. It numbers among its teachers neither Origen from among the Neo-Platonists; nor Augustine with his glorious Confessions; nor Hegel with his dialectic of the universe; nor Schleiermacher in his feeling of absolute dependence; neither does it cultivate the transcendentalism of Emerson, which, like some rare exotic plant in a conservatory of light and warmth, managed to blossom amid the clear, cold analytic of our orthodox New England climate.

It may have more affinity for the vital insight, the intuition given in the very act of living, of which Bergson is now the philosophic knight errant, with lance in rest against all opponents. In its own way, within its proper field of observation, the scientific mind has learned the value of insight as well as of imagination; for to swift intuitions, to daring im-

[1] Ch. II, X.

aginations, science owes some of its most brilliant discoveries and its best-attested utilities. In this way of discovery also it has gained its own reverent sense of the Unknown One. As the man of science beholds in a glass darkly the infinite mystery of the universe, none may understand more religiously than he this recovered saying of our Lord, if, indeed, this saying is a genuine reminiscence of the great Teacher who once walked through the fields with his disciples, and who had not where to lay his head save under the starry Syrian sky: "He that wonders shall reign, and he that reigns shall rest." Even this, the wonder, the reign, and then the rest of mind, may characterize scientific spirituality.

One mark of its spiritual genuineness is its devotion to the service of knowing truth. For science is service, and often a hard service. Scientific devotion, kept unbroken until death, is the troth of a man's being to God's truth, and whether the man who is loyal to it through life is conscious of it or not, this lifelong will to know is itself one of the spiritual powers and a witness of the Spirit in man. It is a

will that might urge archangel on farthest flight to uttermost omnipresence of God in the heavens, eager and ever rejoicing to know the divine order and reason of the creation. Here among the crucibles and mechanisms of the laboratories, shut within the limits of these bodily senses and compelled to work only with quantities that can be weighed and measured, nevertheless the scientific mind bears the sign of the spiritual nobility of human nature, and witnesses its spiritual lordship as throughout the patient years of research it succeeds in bringing one thing after another into subjection to it.

But, you may think, is not this a sceptic's spirit rather than what we are accustomed to regard as spiritual-mindedness? Very likely; but if it be doubt, it is like Abraham's doubt of the worth of life to him should he spend his days keeping his father's scattered sheep; a doubt which was for him the venture of a great faith that led him to seek a better country; scientific doubt may be—I am not saying it always is, but in its nobler aspiration it surely is—the doubt that goes forth to be a

sojourner in a land of promise, not knowing whither it goes, but looking through all this phenomenal world for the reality that has foundations, whose maker and builder may be diviner than we know. I am not speaking in such language of the vainglorious doubt of the intellectual smart set; not theirs the quiet hours of waiting for the self-revelation of nature; nor theirs the faith in reason and reality of the true scientific spirit. I am thinking of the genuine man of science, of the man who will not deny his own intellectual devotion to truth by failing to keep a heart as reverent and as humble as that of the simplest believer who looks up with worshipful eyes to the Madonna and the Holy Child, or who may receive the sacramental symbol of the real presence of God with man.

Still the question may be thrown back, But is there not a real difference between these two mental dispositions? Yes, of course, and yet no. Differences there are of aim, habit, method, mood, and also of religious confession; But many of our religious differences do not go down as deep as one might think. I have

been, for example, at a revival meeting in a Protestant church, and, seated in the rear where I might watch the psychology of the crowd, I have observed the effect, passing like a wave over the congregation, of the evangelist's emotional presentation of the mother story. You recognize the type—the familiar story of the mother and the son—of the evangelist's appeal. Then I stole in mind from that crowded church under the spell of the mother story to a cathedral chapel, where silent worshippers on bended knees, and some with tearful eyes, were offering their devotions before the Madonna and the Child. It was an easy thing to transfer the feeling, the effect from the one place to the other; in the Protestant church it was a picture in words of the mother and her child; in the other it was a painter's vision of the Madonna. But the devotion, the feeling, the spell, were much the same. It was the same appeal of holy purity and love. The differences that keep us so far apart in our external attitudes, or our vain ecclesiasticisms, are not always psychologically so real, so spiritually divisive as they seem. So I would say the scientific

type of spirituality may be more profoundly religious than those who have not experienced it may imagine.

Yes, but after all it may be said: Are you not thus supposing a certain double-mindedness; how can a purely scientific man be a religious believer without becoming a kind of double personality? Certainly no ultimate dualism, no necessary conflict, can be admitted between the natural man and the spiritual man. No final contradiction can be assumed between nature so far as known and the universe that is to be known. How, then, may the sceptic and the mystic exist together in the same honest mind? A sufficient answer would be that they often do. But if one speaks this moment as a scientist and another moment as a religionist, does he not contradict himself? Yes, as life is often caught contradicting itself, that it may the better find its own underlying unities. A closer introspective view may reveal the fundamental integrity of his being. The scientific determinant and the spiritual determinant, to speak in biological terms, do coexist and cowork in one's thinking and liv-

ing, however they may be dissected in our analysis of the contents of consciousness. To cut out either from our living would be to render oneself less than a man. It is also true that either one of these factors, the sceptical or the mystical, may be the dominant and the other the recessive factor in one's natural heredity. But these and other elements of our nature, or phases of our development, are not necessarily vital incompatibles. In different blends they appear and reappear in our individualities. Man is born to live both as a sceptical inquirer and as a spiritual believer; he impairs his inheritance, he trifles with the rich complexity of his nature, if he fails to recognize and make increase of himself through both. To reconcile ourselves to ourselves may often prove a hard task; but it certainly is not to be accomplished by destroying any elemental part of us; not by silencing notes, but by combining them, may we "beat our music out." To be true alike to the natural and the spiritual is to keep to the end our personal integrity; nothing less is perfect simplicity.

There may linger in some minds this sus-

picion concerning what has just been said. Grant, they may think, that a scientific man need not necessarily become a denatured man fit only for laboratory purposes, but not so well for human uses; nevertheless, must it not be admitted that the prevailing temper and usual result of scientific studies have not been to render men distinctively religious; should those studies therefore be admitted with such simple confidence as you suggest into the curriculum of a theological seminary? Should such questions be dropped by professors into the note-books from which youthful preachers must draw materials for their sermons?

To a considerable extent, it must be allowed, the scientific temper has not been confessedly religious, and in some instances it has had a despiritualizing influence. Yet for much opposition of science the hostility of the church must bear its full share of responsibility. When theological dogmatisms put scientific positivism on the defensive, there were hard blows to be received as well as given. But since biblical and historical scholarship has recognized in the method of science its ally, all that has been

changed. The conflict between religion and science is at an end, at least among men of good will and a liberal education. Much of the pseudo-science of the sensational magazines is indeed destructive of spiritual faiths; but that is as unscientific as it is irreligious. Nor is there necessity of spiritual atrophy as a consequence of scientific pursuits. Grant that Laplace, speaking as a mathematician, was right when, in searching the heavens, he said he had no need of the hypothesis of a God; but Kepler was not wrong, nor did he cease to be one of the first among astronomers, when, having discovered the laws of planetary motions, he exclaimed, "I think God's thoughts after him." Nor was Clerk Maxwell's great work in magnetism in conflict with his spirituality when he said, "I have looked into most philosophical systems, and I have seen that none will work without a God."[1] And, to quote but one of many other witnesses to a scientific spirituality, Sir E. Ray Lancaster, in a presidential address to the British Association for the Advancement of Science, reminded them

[1] "Life," p. 426.

that the association had its birthplace under the walls of York Minster, and, quoting these words of Archbishop Creighton, "Religion means the knowledge of our destiny and of the means of fulfilling it," he added: "We can say no more and no less of science. Men of science seek in all reverence to discover the Almighty, the Everlasting. They claim sympathy and friendship with those who, like themselves, have turned away from the more material struggles of human life and have set their hearts and minds on the knowledge of the eternal."[1]

Scientific spirituality, then, is to be esteemed as genuine, although it may not always be a dominant character or may have but slight confession to offer of positive beliefs. For such recognition of it among the prophets of the unseen and the ideal, the saying of the Master is sufficient: "He that is not against us is for us."

It remains for me to suggest some ways in which just this type of spirituality may have its place and service among other recognized varieties of religious experience

[1] *Brit. Assoc. Reports*, 1906, p. 42.

First of all, it is to be said that it is well fitted to survive amid modern conditions of life and thought. It is at once the heir of philosophic doubt and a forerunner of coming knowledge of the highest power in evolution. It shall aid us to take thoughtful heed of the word of the prophet of old who would have Israel know the way of the Lord through their history: "See it," he cried, "see it as a whole." Knowledge of the oneness of the whole creation is not far from faith in the kingdom of God.

Scientific spirituality shall thus come to our aid when at times in the brokenness of our human experiences we shall have most need to regain a unifying sense of life—the uplifting and serene sense of life as a whole and of our personal part and worth in the universal good—the religious sense of our belonging to God's thought and purpose that includes us as parts of its greatness; such as was Jesus' consciousness of his personal life when he said these two words as though they were but one: "My Father is greater than I," and, "I and my Father are one." To this end the natural sciences shall bring their evidence of the signif-

icance even of that which seems least on this little earth amid the vast significance of the whole order of the heavens. Thus the man scientifically trained may believe and disbelieve and yet believe again, may doubt and yet inquire again, as always in the presence of one reality, transcending finite thought, yet known in part. He may impart to us his restful, deeper consciousness of the oneness of himself with all selfhood, of his nature with all nature, of his reason with the universal reason, of his spirit with the spirit that moves the worlds.

Furthermore, this kind of spiritual-mindedness proves useful in preventing other types of religious experience from falling into partialness and exclusiveness to their own hurt. It will serve to check on the one side a perilous tendency to overbelief, and on the other a precipitous fall into unbelief.

The variant forms of religious experience need repeated readjustments, mutual balancings, and reactions for the perfecting of the faithful. Mysticism, left unchecked, becomes a self-consuming flame; pietism, overstrained,

relapses into religious limpness; emotional revivalism is sometimes in peril of losing moral virility. There are not unknown among our churches characters that resemble the inert atoms which physicists tell us are left as resultants of electrolysis; once intensely vibrating in the electric field, then settling on the cathode pole, they have lost their electric charge and become dead atoms; so spiritual emotionalism may end in religious inertia.

Intellectualism likewise in religion is too prone to stiffen into devitalized dogmatisms, a system of orthodoxy to harden into a crustacean rationalism. Among these the free, reverent, sceptical, but truth-seeking spirit of science, often perplexed but not cast down, sometimes persecuted but not destroyed, has been called to its apostolate. In the earthen vessels of its perishable theories it has its treasures—its word of the exceeding greatness of the power of God in nature, and the divers ways of revelation. Well may the Church welcome the spirit of science among its teachers; let those who have no need to feel its doubt and who can not enter into its struggle, know

that it brings from an older theophany than Mount Sinai its law, and that it is not the least of the prophets of the realm of order, of worth, and fulfilments of all ideals.

Another service that science may render to spirituality is to impart to it a simpler naturalness. It leads religion out into nature and brings nature back into religion. It spiritualizes the outward world, not as pure idealism would do by taking materiality out of it, but by perceiving the material take form and life from the spiritual. It leaves us not to wander as shades of ourselves in a realm of shadows; for us all things working together make reality, and our individualities are not as passing clouds catching an hour's sunshine and dissolving into the indistinguishable absolute. In out-of-door religion we live and breathe, and are ourselves in free, full, joyous sense and communion with the life that is in all and over all. The spirit of science shall not take from us the love of nature, which fills our modern poetry as with the voice of many waters; for day uttereth unto day speech of nature's glory to our science, and night unto night showeth knowledge.

Again science is among us to teach our theologies humility. If one were to inquire of the noblest scientific investigators, as well as of the greatest thinkers and seers, at what times they were most profoundly humble, I doubt not their answer would be: at those moments when we were most exalted; when new knowledge inspired us to fresh endeavor; when reason had led us to the last outlook into the infinite beyond; when the mystery of truth inexpressible overshadowed us; then were we most humbly worshipful. God alone is great. In the earlier years of modern knowledge Doctor Chalmers, in one of his famous astronomical discourses, described the "Modesty of True Science." Science may bring to our theologies the lesson of humility it has learned from vaster knowledge of the universe.

The scientific spirit also may teach anew the religious lesson of unworldliness. It is free from the vice of religion for the sake of happiness, which Coleridge once stigmatized, as did Herbert Spencer after him, as other-worldliness. Applied science, it is true, often pays good dividends, as indeed applied religion also may do in

this present world. Pure science disinterestedly pursued for its own sake sometimes brings unsought and unexpected rewards. But lifelong devotion to a single science is in many instances an unworldly aim and may become a sacrificial passion.

A broad-minded Roman Catholic theologian in this country once said: "Property is communion with God through the material world." Still more profoundly may it be said of natural science that it is communion with God through the material world. In unworldiness of aim, also, the scientific spirit enters into the power of the endless life, though it may not be aware of the full reach of its passion for intellectual achievement. But in love of knowledge it has gained survival value. It thinks for eternity. Its will to know the truth can not be satisfied with a few years of limited research in an earthly laboratory. Pure science asserts against all commercializing of education, it affirms above all mere literary playing with realities, that life is worth living as a noble venture for knowledge. In the midst of the unrealities of outworn philosophic speculations it shows by its works its

abiding and inspiring faith that man is made to seek until he finds, to knock and it shall be opened unto him; and thus confessing before the world its working-faith, it brings to religion itself new witness to the inestimable worth of our personal being in a realm of ends; nay, more, it offers the argument of its own high calling that the universe which has brought it to the birth shall not in the end turn upon it and devour it. Amid existing tendencies toward commercializing education; when to go through college is not always to acquire the power to think; when in the world outside, and even in a church-atmosphere too enervating for high argument of divinity, the intellectual pursuit of truth may seem a lonely walk, and few to meet one in that way; when the pews count it a gain that theological preaching is become a lost art, and ministers themselves may be tempted to rest content in calling all men brethren, unmindful of humanities' profoundest cry: "Show us the Father, and it is enough": to us, I would say, at this time, scientific spirituality may come with a clear call and a noble passion, and bid us once and

again seek for the truth of the living God with all our mind and with all our strength; for in fulfilling these words of the commandment one may love also with all his heart.

The stricter intellectual discipline of scientific thinking, issuing, as it does, in a nobler sense of the intellectual worth of life, may renew our faith in man's survival value, and create for the eager scientific spirit a new symbolism for the future life. Fitting symbols for the future reward and joyous activity of the scientific spirit hereafter would hardly be those of the Hebrew-Christian Apocalypse, which to believers of old represented the values of life laid up in heaven. Not the celestial city with gates of pearl and streets of gold would be the symbol of the intellectual immortality and satisfaction of the pure scientific spirit; to it rather the least particle of earthiness that leaves matter nearest the creative power, the last perfection of matter in the wondrous organization of the human brain, and the lines of the spectroscope that bid us understand that this earth of ours is consubstantial with all the celestial spheres—these and such visible signs as

these of the things waiting to be revealed shall be the evidence and the symbols of the glory of the knowledge of God that passeth knowledge. The image of a worthy scientific hope of the life hereafter would not be the seraph with harp of sweetest tone, but rather one like that other angel whom Saint John saw "standing in the sun" at the centre and source of light ineffable, with undimmed eye gazing the whole circle of the heavens round, and calling to all the stars.

Scientific spirituality may not indeed be clothed outwardly in such religious habit as we might deem desirable; but who shall say that it is not worthy, and great shall be its reward. Its presence among us may enhance our religious conception of the worth of life here and hereafter.